DEC 16 1933

METALS & ALLOYS

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The Magazine of Metallurgical Engineering

INCLUDING

CURRENT METALLURGICAL ABSTRACTS

TAPPING A 7½ TON HEROULT FURNACE AT THE TIMKEN STEEL AND TUBE COMPANY

VOLUME 4

DECEMBER 1933

NUMBER 12

A *Guide* TO BETTER PRODUCTS IN 1934

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Metals & Alloys, published monthly by The Chemical Catalog Company, Inc. Publication office: 1117 Wolfendale St., Pittsburgh, Pa. Executive offices: 330 West 42nd St., New York, N. Y. Entered as second class matter March 14, 1932, at the Post Office at Pittsburgh, Pa., under the Act of March 3, 1879. $3.00 a year in U. S.; foreign, $8.00. Vol. 4, No. 12.

METALS & ALLOYS

The Magazine of Metallurgical Engineering

PUBLICATION OFFICE:
1117 Wolfendale St., Pittsburgh, Pa.

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330 West 42nd St., New York, N. Y.

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PUBLISHED MONTHLY BY
THE CHEMICAL CATALOG COMPANY, INC.

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Annual Subscription: U. S., Possessions; $3.00; All Other Countries, $8.00 (Remit by New York Draft). All communications relating to subscriptions or back issues should be addressed to METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

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Entered as second-class matter March 14, 1932, at the post office at Pittsburgh, Pa., under the Act of March 3, 1879.

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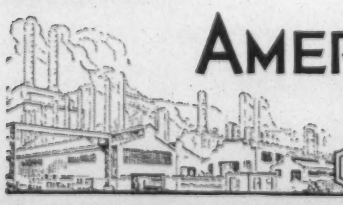

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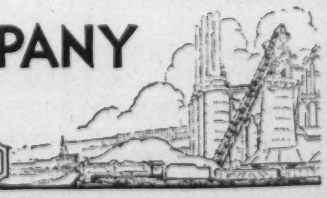

USS Stainless Steel Products also manufactured by following Subsidiary Companies of United States Steel Corporation:

AMERICAN STEEL & WIRE CO., Chicago — *Cold Rolled Strip and Wire Products*

ILLINOIS STEEL CO., Chicago, and CARNEGIE STEEL CO., Pittsburgh — *Bars, Plates, Special Sections and Semi-Finished Products*

NATIONAL TUBE COMPANY, Pittsburgh — *Pipe and Tubular Products*

HIGHLIGHTS

by H. W. GILLETT

Are All Alloys Age-hardenable?

Most every alloy system seems to have some compositions that are age-hardenable when age-hardening is carefully looked for. Garre & Vollmert (page MA 378 L7) find that Ag, Sn or Cd allow it in Pb. Four Japanese authors (page MA 389 L6) find it in Ni, Si and Ni Cr steels. Sauvegot (page MA 389 L7) reports a secondary hardening in V steels due to precipitation of V_4C_3 by an age-hardening mechanism, while Matignin & Calvert (page MA 389 L9) discuss it in the Al Be system.

Titanium Chloride Treatment

This titanium chloride treatment for aluminum apparently only works in English for the Ski's [Broniewski & Smialowski (page MA 378 L5)] couldn't make it behave. Steinhäuser (page MA 392 R1), however, finds a mixture of $AlCl_3$ and NaCl to be effective.

Vacuum Melting

Bottenberg (page MA 392 R2) finds that vacuum melting cuts the oxygen content of mild steel from about 0.03% to below 0.01%, while nickel, melted in ordinary fashion had 0.41% but less than 0.01% on vacuum melting.

Accelerated Corrosion Test Gave Misleading Results

Jominy and Archer (page MA 387 R3) add another to the cases where an attempt at making an accelerated corrosion test gave misleading and incorrect results.

What Would You Expect?

Canadian Mines Dept. (page MA 378 L3) tests 14 lots of Monel bought on open market and find properties to be as stated in trade literature of producer. Why not? Trade literature has to be dependable these days, if it is to have any effect on the purchaser. The consumer soon learns which firms make "puffing" statements and which put out correct engineering dope.

DO YOU want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Metals & Alloys hereby extends to you good wishes for a very Merry Christmas, and hopes that the coming year will bring you all the fulfillment of your strivings.

Supraconductivity

Supraconductivity, the drop of electrical resistance to almost nothing at temperatures approaching absolute zero, intrigues many physicists. Meissner (page MA 377 L8) lists 121 references on this subject. See also Dorfman (page MA 377 R3), McLennan & others (pages MA 377 R9 & MA 378 L2).

A Cadmium-Nickel Sandwich

Because cadmium plating itself is rather soft, Korte (page MA 386 L10) suggests sandwiching a coat of Ni between two coats of Cd.

Internal Stresses

Dietrich & Lehr, Hennig, and an anonymous writer (*Technische Blätter der deutschen Bergwerkszeitung*) all discuss methods of detecting internal stresses in structural parts. (page MA 384 R1, 3 and 9)

Cementation with Uranium or Zirconium

Laissus claims that high surface hardness can be obtained on steel, cast iron and some non-ferrous metals by cementation with uranium or zirconium (page MA 387 R5).

What! No Deoxidizers?

Perrin says he can make killed, piping steel by stirring it with a special slag high in Na_2O without use of deoxidizers. FeO is also said to be removed. (page MA 391 L7)

Absorption of Sulphur in Open Hearth

Absorption of sulphur from the open hearth furnace atmosphere is discussed by Eisenstecken, Schulz & Bierner (page MA 392 R5).

Cadmium in Zinc

Room temperature solubility of cadmium in zinc is less than 0.1% according to Straumanis (page MA 382 L3).

Inclusions as Corrosion Centers

Some inclusions in steel act as centers for corrosion, others don't, says Homer (page MA 380 R1).

Erichsen Tests

Krecek (page MA 384 L10) admits that the Erichsen test is not ideal but thinks it comes closest to evaluating deep drawing properties of all tests proposed.

Cutting Fluid Specs Obstacle

Fixed specifications for cutting fluids are considered by Geschelin (page MA 394 R10) as an obstacle rather than an advantage.

More Rare Metals

Rare metals are being studied, e.g. indium (Murray, page MA 377 R8), lanthanum, cerium, neodymium, yttrium, niobium, etc. (Quill, page MA 382 R 6).

Powdered Metal Bi-metal Strips

Carbonyl metal powder and iron powder, compressed in layers makes a good bi-metal strip, say Hamprecht & Schecht (page MA 377 R4).

Wire Drawing Lubrication

Lubrication in wire drawing is discussed by Macon (page MA 395 L3).

Sponge Iron

They are still working on sponge iron processes in Sweden, Norway, Canada, Germany and Russia according to several abstracts in Section 31 (page MA 401 R1).

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Editorial Comment

H. W. GILLETT

The Things That Count

R. A. BULL

SOME technical and engineering journals comment editorially on the political and economic situations affecting the business prospects of the industries served by those journals. We have refrained, and expect to refrain, from commenting on these matters in respect to metallurgy, not because we have no convictions on them, but because we believe that field should be left to journals of another type than METALS & ALLOYS. One very good reason for avoiding such discussions in a monthly journal is that, in the interim between the writing and the publication of such comment, conditions may and usually do change so materially that we have an act from Uncle Tom's Cabin appearing amid the scenery for Romeo and Juliet.

In METALS & ALLOYS we seek to record provable scientific and technical facts whose application will make for metallurgical progress. Such facts do not depend upon time, place, public opinion or personal reactions, though the speed of their adoption may be influenced by personal factors. Any one can check up for himself whether what is stated about a new metallurgical product or process is correct, while the applicability of a theory of political economy depends entirely upon what people think at the place and time its application is attempted.

People in mass do not think the same in different eras, people of different ages do not think alike, and, in fact, no two individuals will react just alike to the same set of conditions. The country's views on prohibition have changed. Yesterday, the Constitution was universally sacred, today, some hold it as but a scrap of paper.

The metals with which we deal do act alike under the same set of conditions. If they do not appear to, we know that the trouble is that we have not yet separated and controlled all the variables.

Hence, metallurgy and the behavior of inanimate things in general are reproducible, while the behavior of humanity is not definitely reproducible nor predictable. Thus, we can confidently apply what we read in the *Archiv für Eisenhüttenwesen,* for example, to our own problems, but we cannot with equal certainty apply German experiences with inflation. History has a tendency to repeat itself, and one may feel that it would in such a case, but he can't prove that it would.

Even though wars and rumors of wars, politics and the doings of the government agencies of the day that we know chiefly by their initials, may occupy the front pages of the newspapers, is not the progress of mankind based as much on advances in science and technology as on changes in human thought? Did not Hall's winning of aluminum have as great an effect on the life of the nation as did the Boston Tea Party? Is not the development of stainless steel as important historically as the promulgation of the Monroe Doctrine? Will not future history be written from the pages of METALS & ALLOYS and its sister journals in metallurgical and other lines, at least as much as from those of the *Congressional Record?*

To pick names at random, which will have more effect on the welfare of posterity, the publications of Körber or the pronouncements of Hitler; the investigations of E. C. Bain, or the doings of General Johnson?

Public attention may be directed to what men think today, and that counts, but how things react also counts. When the tumult and the shouting die, it will be found that permanent, provable technical advances are the things that in the long run bring mankind a higher standard of living. So we prefer to devote the space in METALS & ALLOYS to the recording in our particular field of those things that will count in the long run, of the engineering facts that are applicable both today and tomorrow.—H. W. GILLETT

Technical Phraseology

PROBABLY most of those who read METALS & ALLOYS remember the three-fold injunction which somebody in the pre-tavern days cleverly phrased for the much-to-be-desired guidance of public speakers: "Have something to say. Say it. Stop talking."

Of course the application is good for those who write as well as for those who orate. Also of course, the admonition should be observed by writers on technical subjects. The command to "say it" implies the use of language that cannot be misunderstood, whether or not infinitives are split, and whether or not newly coined self-indicative words are employed. Carrying the idea further, it will perhaps be admitted that an important obligation resting on technical writers is that of conforming to usage recommended with apparent logic by officially constituted groups of qualified men, in terminology developed to clarify technical literature.

Some years ago, recognizing a serious need for the effort, the American Society for Testing Materials, the American Society for Steel Treating, and the Society of Automotive Engineers formed a joint committee to define heat treatment terms. It was a committee of highly competent, nationally known metallurgists. After wrestling with the problem of terms to distinguish between furnace cooling and air cooling, the decision, confirmed by tentative adoption by the A.S.T.M. as far back as 1927, was to include normalizing (distinctively associated

(Continued on Page 192)

Still another application proves the Economy of CARBOFRAX

REG. U. S. PAT. OFF.

AT the Ballwood Division of the Midwest Piping and Supply Company Inc., they use coke-fired furnaces for heating large pipe and flanges to a welding temperature. Ordinary fire clay brick in the fuel zone lasted but a week even with daily patching.

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They get cleaner welds with "Carbofrax" linings—there is a distinct saving in brick costs—in longer continued furnace operation—in labor costs.

Just another case where "Carbofrax" proves its economy.

Where higher first costs are not to be considered when the service rendered more than justifies it.

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Electric Furnace REFRACTORIES in the Brass Foundry

This paper is submitted to the foundry industry as an official report of the Committee on Non-Ferrous Survey, a sub-committee of the Joint Committee on Foundry Refractories. The data given have been collected and summarized by members of the Committee and the results have been reviewed and approved by its chairman.

The original plan was to devote the investigation and report exclusively to the arc type of furnace. It was later thought advisable to include all brass foundry electric furnaces and every effort was made to obtain the fullest possible information with respect to all furnace types. The bulk of the information furnished by the foundries deals with the arc type of furnace and consequently this type can be and is discussed more fully than other types in the report. The work of the committee has to do exclusively with foundries and consequently this report does not include data from rolling-mill casting shops where the largest proportion of induction-type furnaces is employed. It is not intended that any comparison should be made between furnace types. That would be outside the scope of this committee's work and, in any case, such a comparison would have to include many factors which are not even mentioned in this paper.

The preparation of such a report as this necessarily involves a comparison between different plants as to their practice and their degree of success in carrying out certain operations. In making such a comparison there is always danger of seeming to be unpleasantly critical. To altogether avoid comparisons and contrasts would be to defeat the object of the work. Great care has been taken to emphasize the salient features of the investigation and to draw appropriate conclusions without making use of phraseology which might cause resentment on the part of anyone. Of course, the identity of individual plants cited is not disclosed although some might be recognized from the nature or magnitude of their operations. In any event it is hoped that the value of the information given will amply justify the manner of its giving.

H. M. St. John, Chairman,
Committee on Non-Ferrous Survey

As a subcommittee of the Joint Committee on Foundry Refractories it is the function of the Committee on Non-Ferrous Survey to collect and disseminate information regarding refractory practice and performance in non-ferrous foundries, in order that the industry may be kept fully informed as to progress made and results obtained by actual users of refractories. The following reports have already been published.

"Preliminary Report of Subcommittee on Survey of the Non-Ferrous Foundry Industry." American Foundrymen's Association, 1926.

"Refractories for Brass Foundry Furnaces." American Foundrymen's Association, 1928.

"Refractory-Maintenance Cements in the Non-Ferrous Foundry." American Foundrymen's Association, 1930.

"Care and Maintenance of Fuel-Fired Furnace Linings in the Non-Ferrous Foundry." American Foundrymen's Association, 1930.

The present report deals exclusively with the various types of electric furnace now in brass foundry use. Questionnaires were sent to all brass foundries known to be using any type of electric melting furnace. One hundred and sixty-five known foundry users of electric furnaces were canvassed, with follow-up letters going to the larger concerns not responding promptly in order that the report might be as representative as possible of the entire industry.

The following tabulation shows the scope of the melting operations covered by this report:

Number of questionnaires submitted	165
Replies received	84
Active reports received	63
Number of furnaces represented in active replies	167
Total average daily melting capacity of active responding concerns	780,000 lbs.

The electric furnaces in use by the responding concerns are as follows:

Detroit Rocking Indirect Arc—53 concerns using 129 furnaces.	Repel-Arc—2 concerns using 9 furnaces.
Ajax-Wyatt Induction—7 concerns using 26 furnaces.	Baily Resistance—1 concern using 3 furnaces.

The questionnaire is reproduced here in order to show the type of information sought and to assist in discussing the nature of replies received:

Questionnaire
on
Electric Furnace Lining Performance
submitted to
Sand Casting Brass Foundries
using
Electric Melting Furnaces

(1) Will you indicate the approximate size of your foundry expressed in pounds of metal per day of normal average melting capacity?

(2) What kind of electric melting furnace do you use? How many of each kind and size? Please state KW rating and charging capacity of each type and size.

(3) How many hours a day do you run your furnaces and about how much metal do you take from each? Number of heats or total pounds for each type and size?

(4) What is the approximate chemical analysis of the various alloys you melt? Approximate amounts of each melted per day?

(5) At about what temperature does the metal leave the furnace? State temperature for each alloy.

Response number	Normal aver. daily melting cap.	Number, make and rating of furnaces	Hrs. of daily operation	No. of heats and daily tonnage per furnace	Alloys melted	Pouring temp. °F.	Nature of castings made	Nature and condition of charges	Fluxes or coverings over metal while melting	Building up of slag, precautions and remedies
1	4000 lbs.	1 Detroit 100 Kw.-350 lb.	8.5 hrs.	16-20 230 lbs. each	85-5-3-7	2125-2225	18 oz. each Fire equipment	Ingot, gates, 20% of clean, dry borings	None	Yes. Flux last daily heat and clean hearth afterwards
2	15000 lbs.	3 Detroit 1000 lbs. each 1 Detroit 500 lb.	9 hrs.	5/fce. 1200 lbs. each	Al-bronze 82-86 Cu 11-13.5 Al 3-4.5 Fe	2200	Variety of light jobbing castings	New metals	Trade flux 8 oz./cwt.	Yes. Burn out with arc and chip out slag accretions
3	1800 lbs.	1 Detroit 100 Kw.-250 lb.	1 to 3 hrs. intermittent	1-5	Red Brass 80-10-10 Al-bronze	2100-2200	Light and medium machine castings	Virgin metals and returns No borings	None	Slight. Chip out. Also flux with glass and barium sulphate
4	6000 lbs.	1 Detroit 100 Kw.-350 lb.		14-18 350 lbs. each	74-1-2-23	2200	Light plumbing goods	Dirty. Much non-metallic 25% borings usually dry	None	Considerable building up at corners. Chip out
5	4000 lbs.	1 Detroit 125 Kw.-750 lb.	4 hrs.	5 4000 lbs.	86-8-1-5 85-8-5-2 80-10-10	1950-2250	Light to medium	Clean charges containing 25% dry borings	None	No problem
6	7200 lbs.	1 Detroit 100 Kw.-350 lb.	8-2/3 hrs.	19-20 3600 to 4000 lbs.	75% Yellow Brass 25% 85-5-5-5	2300-2400 1900-2000	Light wt. pressure castings	Contain 50% oily turnings	None	Yes. Chip out
7	6000 lbs.	1 Detroit 200 Kw.-750 lb.	9 hrs.	6 1000 lbs. each	75% of Melt contains 8 to 15% Pb other high-Pb mixes. Also 90 Cu 10 Sn	2300	Bushings and worm wheels ½ lb. to 1500 lbs. each	Contain 20% wet turnings	None	No problem
8	50000 lbs.	Detroit 3—2000 lb. 1—1500 lb. 2— 750 lb. 1— 350 lb.	9 hrs.	7, 2000 lbs. each 7, 1500 lbs. each 6, 700 lbs. each	85-5-5-5 20-25% lead. Yellow brass & Tobin bronze	1900-2250	Light automotive castings	40-50% borings Some dry, others contain oil and water	None	No problem
9	25000 lbs.	4 Detroits 125 Kw.-350 lb. each			85-5-5-5 20 different mixtures		Plumbing goods, valves and fittings	30% turnings containing 3% oil and H_2O	Borax flux	Yes. Flux and chip
10	6800 lbs.	1 Detroit 125 Kw.-350 lb.	9 hrs.	16, 425 lbs. each 6800 lbs.	78-2-6-14	2250	Plumbing goods	Virgin metal returns 16-2/3% dry chips	None	Not serious. Use borax, barium sulphate and glass
11	10000 lbs.	5 Repel Arc 300 lb. each	10 hrs.	3500 lbs./fce.	Red brass mixtures Small amt. of Ni alloys	2100-2200 Red Brass 2550-2600 Ni alloys	Light and heavy valve and fitting parts	Clean metal. No turnings	Charcoal 3 lbs./heat	Avoid trouble by charging only clean materials
12	10000 lbs.	Baily Resist. 1—105 Kw.-1500 lb. 2—75 Kw.-750 lb.	12 hrs.	6500 lbs.—105 Kw. 3500 lbs.—75 Kw.	83% Cu bronze 66% Cu brass	2200-2300	Light hardware	Clean. 10% dry turnings	None	No
13	15000 lbs.	Detroit 1—750-1000 lb. 2—350 lb.	9 hrs.	800 lbs. 350 lbs.	Brass; Ni-Cu alloys Pure Ni; Cr-Ni; Cr & Fe alloys		Plumbing. Pressure fittings, valves and trimmings			
14	2600 lbs.	1 Detroit 75 Kw.-350 lb.	9 hrs.	4-5 575 lbs. each	83-4-6-7 principal mix. Also 85-10-2.5-2.5 75-10-15 Pb	2000-2200	2 oz. to 350 lb. Pump castings	Clean metal Contain 15-100% dry chips	None	No trouble
15	2100 lbs.	1 Detroit 100 Kw.-350 lb.	7 hrs.	6, 350 lbs. each	30%-85-5-5-5 40%-87-8-3-2 30%-88-10-2	2000	75% Light 25% Heavy Castings	Mostly clean 20% dry turnings	Use a brass scavenger flux ½ lb./cwt.	No problem
16	7500 lbs.	2 Detroit 75 Kw.-350 lb. 100 Kw.-350 lb.	9 hrs.	10-12 7500 lbs. total	85-5-5-5 (2000 lbs.) 66-1-1-32 (5500 lbs.)		Light refrigerator hardware	All ingot	None	Serious problem. Chisel out
17	50000 lbs.	6 Detroit 4—200 Kw.-800 lb. 2—75 Kw.-200 lb.	9 hrs.	15, 800 lbs. each/fce. 15, 200 lbs. each/fce.	88%-78-2.5-10-9-.5 Ni 3%-84-3-5-7-1 Ni 9%-77-5-10-6-2 Ni	2200	Mostly light (under 2 lbs.) pressure castings	Clean. 27% dry turnings	Occasionally use barium sulphate	Yes. Heat up to 2400°F. to melt slag, weekly. No special precautions
18	8500 lbs.	1 Ajax-Wyatt. 60 Kw.-900 lb.	8 hrs.	5, 900 lbs. each. Total 4500 lbs.	66-2-32	2150	Light plumbing goods	12% dry turnings	None	Slight. Not serious. Bar out after each day's run
19	4000 lbs.	1 Detroit 75 Kw.-250 lb.	3 to 10 hrs.	16, 250 lbs. each 10 tons	77-3½-2½-16		Scale beams up to 35 lbs. Poises 3 oz.-5 lbs.	Ingot and returns No chips	Borax 3 oz./heat	No trouble with slag
20	8000 lbs.	2 Detroit 100 Kw.-350 lb. each	9 hrs.	10-12 350-450 lbs. each. Total 8000 lbs.	85-5-5-5 65-5-30	2250-2100	Light and medium	Clean No turnings	None on red mix. Glass on yellow brass mix	No trouble. Slag out every 2 or 3 heats
21	3500 lbs.	1 Detroit 125 Kw.-350 lb.	8 hrs.	10 3500 lbs.	70-3-27	2000	Average wt. 1 lb.	Relatively clean 100 lbs. dry turnings/heat	½ lb. brass cleaner heat	Not serious. Knock out each A.M.
22	7500 lbs.	2 Detroit 250 Kw.-750-1000 lb.each	8 hrs. inc. 1 hr. patching and preheating	7500 lbs.—one furnace 5000-6000 lbs. each when running 2 fces.	78-4-16-2	2200-2250	Average 18 lbs. Bearing liners	Comp. clean 15% alloy chips 12.5% Cu turnings	None	Yes, but not serious. Melt and scrape out slag several times daily
23	7500 lbs.	3 Detroit 1— 90 Kw.-250 lb. 1—100 Kw.-350 lb. 1—125 Kw.-350 lb.	7 hrs.	3000 lbs.—250 lb. fce. 5000 lbs. both 350 lb. furnaces	85%-87-7-2-4 10%-85-5-5-5 5% Mn bronze	2400	Light castings—railway accessories	Clean No turnings	½ lb. special flux/heat	No difficulty. No precautions
24	12000-15000 lbs.	2 Detroit 100 Kw.-350 lb. each	9 hrs.	20/furnace	65-2-33	2150	Light plumbing, oil and gas goods	Scrap materials 15% dry borings /heat	None	Yes. Use borax and crowbar
25	3750 lbs.	1 Ajax 60 Kw.-750 lb.	7 hrs. melting	5/day 750 lbs./heat	85-2½-1½-11 76-3-3-18	1900	Plumbing supplies	Clean Turnings dry	None	No problem. Clean after each heat
26	5000 lbs.	1 Detroit 150 Kw.-350 lb.	6 hrs.	6, 550 lb. each 3300 lbs.	Principally 80-10-10 Also some straight Cu	2200-2300	Light and medium	Clean metal only No borings	2 lbs./charge (Flux consists of 5% silica sand, 25%	No difficulty
27	16450 lbs.	5 Detroit 3—175 Kw.-800 lb. 1—100 Kw.-400 lb. 1— 80 Kw.-225 lb.	9 hrs.	8, 800 lbs. each/furnace 15, 400 lbs. each 18, 225 lbs. each.	85-5-5-5 76-8-16	2350	Light plumbing goods.	Clean. 4% dry turnings	None	Very little. Not serious. Scrape out. Do not overheat

Nature of refractory. Amt. of insulation	Patching material used	Method of patching	No. of heats per lining before replacement	Method and time of seasoning a new lining	Method of washing or glazing a new lining	Part of lining requiring most frequent patching	Refractory cost
High alumina firebrick. 1″ insulation	Grade A. Elec. fce. patch	Use a high alumina wash	2800-2900	Slow wood fire 12 hrs. Follow mfrs. instructions	Alumina wash. Thick cream consistency	Around door, spout, top and sides	No record
High alumina firebrick	Fireclay patch	No attempt to patch small holes	300	Charcoal and coke. Arc 120 and 200 kw. hrs. 2 days	Cement wash	Port holes. Pouring area	No record
High alumina firebrick	Sillimanite	Inspected each day. Patched as required	1100 to date. In perfect condition	Mfrs. instructions	Glazed with molten glass after patching with Sillimanite	Roof, door and spout	$1.75/ton material and labor
High alumina firebrick	Aluminous oxide material		3000-4000	Intermittent arc application	None	Top, just above door	No record
Standard firebrick shapes. 4½″ insulation	Fireclay patching preparation	Thin coating weekly. Patching after 400 heats	700-1134	Small gas flame. 24-36 hrs.	Coat with plastic cement	Crown	$126.00 total. Average 35c/ton
Preformed firebrick. ¾″ Sil-o-cel	Fireclay patching preparation	Cleaned and patched each morning	3500-4000	Air dry one day. Wood fire 10 hrs. Preheat with arc to cherry red heat	None	Center of circle	No record
High alumina firebrick. 4″ insulation	Sillimanite ramming mix	Air ram patches. Patch after 150 heats, thereafter weekly	Average 1400	48 hrs. preheat. Intermittent arc applied	Wash with slurry of Andalusite cement. Dry between applications	Hearth	Material and labor new lining—36c/ton. No patching cost figures
High alumina firebrick. 4½″ insulation	Sillimanite patch	Weekly patching. Use material dry as possible and ram hard	1000		Glaze with sand and lime mixture	Door jambs and lentel block	Material and labor—25c/ton
Sillimanite			1000	Mfrs. instructions	None	Ends	
High alumina firebrick. 1″ Sil-o-cel	Aluminous oxide material	Chip slag and key in patch. Patch weekly after second week	1100	Charcoal fire over night. Intermittent arc until cherry red	Thin wash coat of high alumina	Top	Patching material and labor — 27c/ton. New lining 33c. Total—60c/ton. Brass—92c/ton
Special patented crucible. 5″ Jersey fire-sand insulation	Crucible patch	Patch spout only. Crucible cannot be patched	400 brass, 175-200 Ni alloy	Wood fire over night	None	Spout	Material cost. Ni alloy—$2.00/ton
Firebrick. 4″ insulation	Carborundum fire sand and fire clay	Weekly patching	Walls and roof —1 year. Trough —4 months	48 hrs. power applied to reach 2300°F.	None	Door opening and piers	
	Prefired shapes		2200-3000 brass and bronze 1000 tons				
Firebrick	Carborundum fire clay mix	Patch after 200-300 heats	600	12-15 hrs. preheating	None	Roof	No information
Sillimanite. Ramming mix	Sillimanite	After 100 heats patch around door. After 400 heats patch ends	Average 700	Slow fire 24 hrs.	Have not found glazing beneficial	Around door opening	Material and labor —new lining $1.14/ton. Patching 73c/ton. Total $1.87/ton
Firebrick. 1″ insulation		Each A.M. after 100 heats	1500	Intermittent arc. 24 hrs.	High alumina	Above door	
800 lb. furnace. 4½″ insulation, 4½″ firebrick, 9″ straight end walls, circle high alumina	End walls fire brick or sillimanite. Circle high alumina brick or sillimanite. Silicon carbide cement around door	Sills and spouts patched with silicon carbide. Very little patching otherwise	1000/refrac. lining. 2000-3000 insulation. 200 lb. furnaces patched weekly with Sillimanite or Andalusite.	48 hrs. gas flame. Arc to operating temp. Held there 3 hrs. before charging	None	Sill and roof. Let roof brick burn down to 1″ thickness and then replace	19c labor, 63c material. Total 82c/ton
Furnace maker's materials only	Furnace maker's	Very little. Charging door only	Average 1200, 540 tons; max. 2900, 1325 tons	Coke fire 12 hrs.	None	Directly inside charging door	540 tons. 29c/ton. Total $155.00
High alumina firebrick	Calcined alumina 3500°F. high temp. cement	Patch very seldom	1200	Dry out over pit fire one month. Preheated 8 hrs.	Glass for glazing	Around spout and near electrodes	No data
Jersey refrac. 1½″ insulation	High temp. furnace patch	Usually each A.M.	500-600	Wood fire 12 hrs. Arc—10 hrs.	Molten glass 1 hr. before charging	Around door	New lining cost—material and labor 61c/ton. Patching labor 9c/ton
4½″ firebrick. 1″ insulation		Repair bad spots at once	2368	Wood fire 4 days. Intermittent arc	2 coats of thin laying mixture on new lining	Opposite door	
Diaspore firebrick. 4½″ insulation	Andalusite patch	Chip out slag, dovetail patch. Ram hard, dry slowly, fuse with arc after 50th heat	350	Wood fire 48 hrs. Intermittent arc 12 hrs. Three 24 hr. days for seasoning before charging	Andalusite wash. Glass glazing. Fused glass about weekly	End walls and door jambs	New lining $1.23/ton. Patching 87c/ton. Total $2.10/ton
Preformed 1″ insulation		Patch weekly after 100 heats	3600-3700	Charcoal fire over night. Int. arc 4 hrs. 48 hrs. total seasoning	Glass	Roof	Lining cost 16c/ton. No patching figures available.
High alumina firebrick	Andalusite patch	Patch daily	Approx. 1000	Charcoal 24 hrs.	None	Near spout	
	Silicon carbide	Usually at end of day	Lining life usually one year. 5 heats/day. Est. 450 tons	Gas or oil burner		Side walls	
High alumina firebrick	Andalusite	Spout only. 3 times weekly	650-750	Charcoal fire 24 hrs. Intermittent arc 5 hrs. Cherry red and charge	None	Spout	All material and labor including electrical energy insulation—40c/ton
lime, 25% fluorspar, 5% charcoal, 20% soda ash, 20% iron ore)							
High alumina firebrick	Silicon carbide and clay	Weekly	1600 @ 800 lbs., 1800 @ 400 lbs., 1600 @ 225 lbs.	Charcoal fire 48 hrs.	None		New lining cost, 800 lb. fce., 31c/ton; 400 lb. fce., 25c/ton; 225 lb. fce., 42c/ton. Est. patching cost, material and labor, 12c/ton

Response number	Normal aver. daily melting cap.	Number, make and rating of furnaces	Hrs. of daily operation	No. of heats and daily tonnage per furnace	Alloys melted	Pouring temp. °F.	Nature of castings made	Nature and condition of charges	Fluxes or coverings over metal while melting	Building up of slag, precautions and remedies
28	6000 lbs.	2 Detroit 75 Kw.-350 lb. each	9 hrs.	12 @ 250 lbs. 3000 lb./ furnace	50% red brass 35% Pb bearings 15% Yellow brass	2300	Light, medium and heavy jobbing work	Clean charges 1/3 turnings	None	No problem
29	40000 lbs.	10 Detroit 4—150 Kw.-375 lb. 6—100 Kw.-375 lb.	9 hrs.	16, 6000 lbs. each/furnace 150 Kw. 14, 5250 lbs. each/furnace 100 Kw.	85%-85-5-5-5 10% Mn bronze 5% Misc.	2300 1900	Light and heavy valves and trimmings	16-27% dry turnings	None	Some accumulation. Sand on gates. Use borax. After Mn bronze blow out Zn oxide with air
30	1500 lbs.	1 Detroit 75 Kw.-350 lb.	5 hrs.	5 @ 300 lbs. 1500 lbs. average daily production	78%-85-5-5-5 20%-88-10-2 2%-80-10-10	2200	Light, medium and heavy jobbing	Virgin metal principally	None	Heat slag with arc. Remove with bar
31	1450 lbs.	1 Detroit 75 Kw.-250 lb.	8 hrs.	8-9	65-2-33 principal mix	1700	Light	Clean. Small amount dry chips	None	Use borax
32	5000 lbs.	1 Detroit 100 Kw.-350 lb.	9 hrs.	15, 350 lbs. each	No. 1 yellow brass	2250	Light. Lighting fixtures	10% dry brass chips		Not serious
33	13199 lbs.	4 Detroit 125 Kw.-400 lb. each	9 hrs.	2 fces.—5200 lbs. each/ day 2 fces—operated 27% of time	85-5-5-5 76-2½-3½-18	2200 2000	Light and medium plumbing goods	Clean. Turnings are pigged	Small quantity	Melted with arc. Flux is used
34	4000 lbs.	1 Detroit 75 Kw.-250 lb.	3 hrs.	6, 160 lbs. each	Principally 85-5-5-5	2050-2250	Light and medium Bearings	Fairly clean Oily but no borings	None	Not serious. Removed weekly with arc
35	8000-10000 lbs.	2 Detroit 125 Kw.-350 lb.	16 hrs.	500 lbs./ heat	3 tons—76-7-15-2 1½ tons—75-5-18-2 ½ ton—85-5-5-5	2200-2250	Light and medium Jobbing and railway castings	Clean. 20% dry turnings	None	No trouble. Scrape out after each heat.
36	10000-12000 lbs.	3 Detroit 1—75 Kw.-250 lb. 1—150 Kw.-350 lb. 1—200 Kw.-900 lb.	10 hrs.	75 Kw.—4500-5000 lbs. 150 Kw.—5500-7000 lbs. 200 Kw.—10000-12000 lbs.	90%-83-1/3 Cu 8-1/3 Pb 8-1/3 Zn 85-10-2½-2½	2250 2175	Light Thin walls	Clean. 20% dry turnings	None	Yes. Scrape out. From sand on gates. Not serious
37	35000 lbs.	6 Detroit 3—175 Kw.-1000 lb. 2—125 Kw.-350 lb. 1—400 Kw.-2000 lb.	9 hrs.	8000 lbs. each 175 Kw. 4000 lbs. each 125 Kw. 12000 lbs. each 400 Kw.	60%-78-2-7-13 40%-87-6-3-4	2100 2200	Average 12 oz. pressure goods	Clean. 15% dry turnings	Borax and barium sulphate. 0.2% total with charge	No building up. Bar and sledge. Keep clean
38	10000 lbs.	2 Detroit 1—100 Kw.-250 lb. 1—150 Kw.-350 lb.	9 hrs.	20, 250 lb. each 15, 400 lb. each	85-5-5-5 entirely	2150	Medium fittings	25% dry turnings Gates and ingot	None	Scrape out twice daily with steel hoe
39	30000 lbs.	4 Ajax-Wyatt 80 Kw.-900 lb.	10 hrs.	600 lbs./ heat 2 furnaces operating	81.5-3-7-8.5 84-3-3-10	2050-2200 2050-2350	Light	Relatively clean 20-25% dry turnings	Layer of charcoal	Yes. Not serious. Chip out with bar
40	14000 lbs.	Repel Arc 3—800 lb. 1—400 lb.	9 hrs.	5600 lbs./ furnace (800 lb.) 4500 lbs. (400 lb.)	85-5-5-5	2200-2300	Light and medium	Relatively clean ½-1/3 turnings	Cover of lime and fluorspar	Not important
41		2 Detroit 125 Kw.-450 lb.		Inactive						
42	1500 lbs.	1 Detroit 100 Kw.-350 lb.	8 hrs.	5, 300 lbs./ heat	85-5-5-5	2100	Plumbing supplies	Clean metal	None	Not serious
43	45000 lbs.	8 Detroit 125 Kw.-350 lb.	9 hrs.	15/furnace 6000 lbs. each	12 tons—85-5-5-5 8.5 tons—87-7-4-2 1 ton—82-4-5-9 1 ton—Ni and Ni alloys	2250	Light and medium valve castings	Clean metal No turnings	None	No difficulty. Clean furnaces after every 5 heats
44	16000 lbs.	4 Detroit 125 Kw.-350 lb.	9 hrs.	12-13 average 2 tons/ furnace	7 tons—85-5-5-5 1 ton—80-3-7-10	2250-2300	Medium Valve castings	Sand on gates 19% turnings contains 0.5% oil	None	No difficulty. Loose material removed after each heat.
45	2500 lbs.	1 Detroit 75 Kw.-250 lb.	8 hrs.	5-10/day 250-300 lbs. /heat	85-5-5-5 88-10-2 Mn bronze Yellow brass		Ordnance castings			
46	8700 lbs.	2 Detroit 100 Kw.-350 lb.	10 hrs.	3150 lbs./ furnace 9 350 lbs. each	84-2½-2½-11	1950-1980	Misc. hardware Light and medium	Clean No turnings	Charcoal	Not of any account
47	14000 lbs.	2 Detroit 1—75 Kw.-200 lb. 1—125 Kw.-350 lb.	9 hrs.	2800 lbs. 4000 lbs.	85-5-5-5	2250	Medium and light Meter and water goods	Clean No turnings	None	No accumulation. Scrape out after each heat
48	4000 lbs.	1 Detroit 125 Kw.-350 lb.	9-10 hrs.	300 lbs./ heat 3000-4000 lbs./day	88-10-2 85-5-5-5	2250 2100	Light and medium	Fairly clean Few turnings Sometimes oily	None	Only when melting stainless steel. Slag accumulates
49	7000 lbs.	1 Detroit 125 Kw.-350 lb.	9 hrs.	3600 lbs. 18-200 lb. heats	75%-78-1-7-14 25%-85-5-5-5	2150	Light and medium. Valves, steam goods and water meters	Clean. 25% dry turnings	None	Not serious. Use borax
50	8000 lbs.	4 Detroit 125 Kw.-350 lb.	8 hrs.		Aluminum Red brass Yellow brass Iron	1400 2200 2000 2950	Medium and light	Clean. 25% dry turnings	None	No
51	250 lbs.	1 Detroit 75 Kw.-250 lb.	8 hrs.	2 175 lbs. each	Bronze Gun metal Brass Iron	2200 2[illegible]25	Light	Clean Few turnings Dry and Clean	¼ lb. glass/ heat of brass ¾ lb. lime/ heat of iron	Remove slag with mixture of lime-sand. No problem

Nature of refractory. Amt. of insulation	Patching material used	Method of patching	No. of heats per lining before replacement	Method and time of seasoning a new lining	Method of washing or glazing a new lining	Part of lining requiring most frequent patching	Refractory cost
High alumina fire-brick	Al oxide and Si carbide cements	Each A.M. slight patching	1450 each to date. These are original linings good for indefinite service	Wood fire. Glaze patches with arc	Wash on thin layer refractory		
High alumina fire-brick	Silicon carbide and clay		1030	Intermittent arc	None	Door and spout	New lining—material and labor — 36c/ton. No cost on patch
High alumina		Patch every A.M.	2069	Wood fire over night	High alumina refractory wash	Door and spout	
High alumina	Andalusite	Weekly and when necessary	Over 2000	Manufacturer's directions	Wash with Alundum cement	End walls around electrodes	
High alumina	High alumina	Week-end patching	5000-5500	Intermittent arc 10 hrs.	Use Aloxite	Door section	New lining cost — material and labor, installation and burning in—11c/ton. No patching cost
High alumina	Andalusite mix	Patch weekly after second week. Andalusite	2500 average	Slow arc 2 hrs. Charge immediately	Silica sand	Roof	New lining cost — material and labor 13c/ton. Patching 29c /ton. Total 42c/ton
High alumina. 1¼" Sil-o-cel	Fireclay and crushed brick	Weekly. Spout twice a week	2000-2850	Intermittent arc	Glazed with refractory cement	Spout and roof	No exact figures but estimated 40-50c/ton
High alumina. 1" insulation	Andalusite mix	Weekly inspection and patching	1100-1300	Coke and charcoal. Intermittent arc	Silica sand and lime	Spout and port holes	New lining—material and labor 41c/ton. Maintenance 28c/ton. Total 69c/ton
High alumina	Special cement	Every Monday A.M. cold furnace. Remove loose pieces. Trowel into place. Fill cracks. Wash thoroughly thin mix	Average of 10 linings each. LF—1325, 331000 lbs.; LFA—697, 313000 lbs.; AA —915, 823000 lbs.	12 hrs. gas or charcoal fire. Arc cherry red	Wash with high temperature cement	Roof	Material and labor. New lining LF 38c, LFA 51c, AA 40c. Patching LF 40c, LFA 40c, AA 50c/ ton. Total LF 78c, LFA 91c, AA 90c
High alumina	Plastic fire clay and Andalusite	Weekly	175 kw.—1200 125 kw.—2500 400 kw.—800	Manufacturer's instructions	Andalusite wash	Electrode section, door and roof	Average 32½c/ton of melt
High alumina	Andalusite	Chip out slag. Drive patch in hard and dry. Hold above 2300°F.—10 min.	1200-1500	10 hr. wood fire. Intermittent arc	None	Spout	62½c/ton. New lining installed plus patching material
Preformed high alumina set with chrome ore cement	None		Aver. 1700. Range 941—2163	Air dry for periods up to 6 months. 8 hrs. gas torch	None		55c/ton
Ganister bottom. 9" key brick	Plastic fire clay	Holes are patched as they develop. Top row or two of brick are replaced periodically	500	Line over the week-end. Charcoal fire. Melt Monday A.M.	None	Top or cover. 30-40 key brick once during the life of lining	
High alumina	Andalusite		1000-1500	Manufacturer's instructions	Glass or silica sand	Electrode ports and spout	
High alumina	Special cement	Start patching after 400-500 heats	Aver. 6600 on bronze. Monel—2000			Pouring spout	Patching — 20c/ton. Lining 6c/ton. Total 26c/ton
Mullite brick	Mixture ganister Si carbide and high alumina cement	Week-end patching cut slag-key patch. Wood fire wash with aluminous oxide material	2300-2400	Intermittent arc	Wash well with aluminous oxide material	"Breast"	Patching material $1.00, labor 60c, linings 56c. Total $2.16
High alumina	Special cement		Over 2500. Original lining remains in perfect condition	Life of lining is indefinite. Maintained constantly in perfect condition			
High alumina	Aluminum oxide cement	Daily inspection. Weekly chip-out and patch. Weekly wash	6727 each to date. Still O.K.	Wash lining with refractory cement and stand over night	Preheat. Melt broken glass	Roof	$1.08/ton total
Special brick	Andalusite		1000-1100	Wood fire over night. Intermittent arc	None	Spout and door section	94c/ton 350 lb. furnace. $1.23/ton 200 lb. furnace
Andalusite	Andalusite				Molten glass	Roof	
High alumina	Plastic fire clay and Si carbide cement	Every week-end	One year. 4500-5000 and over	Spare shell lining dried out by hot electrode between heats of furnace in service	Andalusite cement	Roof	No data
High alumina	Andalusite	Patch cold furnace when needed	All original linings still operating. Al—over 500, brass—over 1450, iron—over 800	Manufacturer's instructions	Glass in brass furnaces	Door section	No data (see lining life)
High alumina	Plastic fire clay and Andalusite	Patch daily as needed	1500-1800		Andalusite wash with sodium silicate	Door and spout	No data

Response number	Normal aver. daily melting cap.	Number, make and rating of furnaces	Hrs. of daily operation	No. of heats and daily tonnage per furnace	Alloys melted	Pouring temp. °F.	Nature of castings made	Nature and condition of charges	Fluxes or coverings over metal while melting	Building up of slag, precautions and remedies
52	5000-30000 lbs.	4 Detroit 150 Kw.-350 lb.	9½ hrs.	16-18/ furnace 375 lbs. each	85-5-5-5 and similar red valve alloys	2100-2250	Valve bodies and trimmings	Clean. 25% dry chips	None	
53	8400 lbs.	2 Detroit 125 Kw.-350 lb.	6½ hrs.	13 each	85-6-4-5 6300 lbs./day 83-16 Sn-.85 Zn 2100 lbs. /day	2100	Jobbing. Light and medium	10% virgin metal 90% clean scrap No turnings under 1% oil	None	Not serious. Flux with lime. Chip out occasionally
54	4500 lbs.	1 Detroit 100 Kw.-350 lb.	8 hrs.	12	78-4-4-14	2100-2150	Battery terminals only	Clean. 50 lbs. dry borings/heat	None	Yes. Slag out end of each day. Keep charges clean as possible
55	26000 lbs.	1 Ajax 100 Kw.-1000 lb.	10 hrs.	7000 lbs.	70-2¼-2¼-25½	1985	Plumbing goods	100% turnings	20 lbs. Soda ash/1000 lbs. turnings	Practically none
56	4000 lbs.	1 Ajax 75 Kw.-900 lb.	8 hrs.	5, 660 lbs. each 3300 lbs. total	75% bronze and other alloys	2100-2250	Light and medium fixtures	Clean No turnings	None	No
57	6000 lbs.	1 Detroit 125 Kw.-750 lb.	9 hrs.	8	83% Cu bronze 66% Cu brass	2100	Light Hardware	Clean No turnings	None	Not serious. Melt out with arc
58	30000 lbs.	4 Detroit 2—125 Kw.-350 lb. 1—100 Kw.-250 lb. 1—200 Kw.-750 lb.	9 hrs.	350 lb. 14 each 250 lb. 16 each	81.5-3-7-8.5 84-3-3-10	2050-2200 2050-2350	Light	Relatively clean 20-25% dry turnings	None	Yes. Not serious. Slag out with arc
59	8700 lbs.	1 Ajax-Wyatt	8½ hrs.	2400 lbs.	65-3-32	1650-1680	Builders' hardware Light and medium	Clean No turnings	Charcoal	Builds up in melting chamber. Remove with air hammer and long chisels
60	26000 lbs.	1 Detroit 125 Kw.-350 lb.	10 hrs.	5250 lbs.	82½-3¾-5¼-8½	2175	Plumbing goods	10% turnings	None	None
61	4000 lbs.	1 Detroit 75 Kw.-350 lb.	4 hrs.	2, 350 lbs. each 700 lbs. total	75% bronze and other alloys nickels	2100-2250 bronze 2250-2500 nickel	Light and medium Fixtures	Clean No turnings	None	No
62	4000 lbs.	3 Detroit LF 75 Kw.-250 lb.	9 hrs.	12, 200 lbs. each/ furnace	All alloys Jobbing foundry work	2200	Jobbing castings Medium and light	Clean. Scrap, pig and virgin Clean chips 25%	None	Not serious
63	100000 lbs.	17 Ajax-Wyatt 75 Kw.-1000 lb.	24 hrs.	1000 lbs./ heat	72-3-25 85-5-5-5	2000 2200	Light and medium Plumbing goods	Clean metal 20% dry turnings	Lime charcoal soda ash	Yes. Must be removed once each week

(6) Please state the general nature of the castings, indicating whether light, medium or heavy.

(7) Are the metal charges relatively clean or do they contain a good deal of non-metallic material? What proportion of turnings is used? Are the turnings wet or dry? If wet, do they contain oil or water and approximately how much?

(8) Do you use fluxes or covering slags? If so, what and how much?

(9) Do you have difficulty with the building up of slag in the melting chamber? If so, how do you remove this slag? Is it a serious problem? Do you take any special precautions to avoid this condition?

(10) What kind of brick or refractory materials do you use for furnace linings? In replying to this you may describe the type of material or give the name of the manufacturer and the grade, name or number which he assigns to it. Please state nature and thickness of insulating lining back of refractory.

(11) What patching material do you use? (If you use any of the special refractory cements, give the maker's name and the trade name or number which he gives to the cement.)

(12) Please describe your patching practice briefly. How soon do you start patching a new lining and how often do you patch?

(13) How many heats of metal do you get before the lining has to be entirely replaced?

(14) Describe briefly your method of preheating or seasoning a green lining, stating how much time you allow before charging.

(15) What method, if any, do you use for washing or glazing over a new lining before starting to melt?

(16) What part of the lining requires most frequent patching?

(17) Give what information you can regarding total refractory costs, including material and labor for original installation; also for patching (itemized if possible).

The active reports received are summarized here in tabulated form to facilitate rapid comparisons of results and analysis of the individual items of performance. See Table I.*

*Editor's Note: Table I is the extensive tabulation of the 63 Active Responses here attached.

BAILY RESISTANCE AND REPEL-ARC FURNACES

Since but one concern reported on the Baily and two concerns on the Repel-Arc furnaces, and in view of the diminishing use of furnaces of these types, only brief mention will be made of them.

The Baily furnace user, melting yellow brass and hardware bronze, stated that no cost data were available. A life of one year is reported for walls and roof while the trough is replaced every 4 months. Walls and roof are constructed of high grade fire brick of high alumina content while the trough is of a carborundum fire-sand mixture. Frequent trough replacement is doubtless a considerable item of expense in this unit and it is to be regretted that no cost figures were given.

One Repel-Arc user states that a special patented crucible is used which gives a life of 400 heats on red brass, resulting in a crucible cost of 92c per ton of brass. On nickel alloy, this same user obtains 175 to 200 heats at a crucible cost of $2.00 per ton of alloy melted.

The other Repel-Arc user melts red brass nine hours daily, using a rammed and brick lining. The bottom is of gannister, while the sidewalls are of 9 inch keybrick of first quality. 500 heats per lining are reported but no cost figures given.

ANALYSIS OF RESPONSES FROM AJAX-WYATT FURNACE USERS

Seven concerns have reported using a total of 26 furnaces. Six of these users operate 9 furnaces, 8-10 hours per day, while the seventh user has a battery of 17 furnaces, operating 24 hours per day. It is assumed in the latter case that the furnaces are not all in simultaneous operation, inasmuch as the total capacity is reported as 100,000 pounds per day.

These installations are used for the production of plumbing goods, valve castings, hardware and fixtures. Three concerns melt yellow brass exclusively, one of which reports 1200 heats per lining (pouring temperature 2150°F.), another 2500 heats (pouring temperature 1985°F.), while no information is given by the third as to lining life. In each case the refractories used are those of the furnace manufacturer.

Nature of refractory. Amt. of insulation	Patching material used	Method of patching	No. of heats per lining before replacement	Method and time of seasoning a new lining	Method of washing or glazing a new lining	Part of lining requiring most frequent patching	Refractory cost
Original lining high alumina	Ganister and fire clay mixture	Weekly and as needed	10000-12000. Lining lasts indefinitely. Maintained constantly in perfect condition				Material and labor. Total 28½c/ton
High alumina	Andalusite	Every 2 or 3 weeks. Chip clean. Key back. Drive hard. High heat	Have run original linings over 18 months. Still O.K.	Manufacturer's instructions	Andalusite rammed and washed over entire surface	Above the door. 4 hrs./furnace each 2 weeks	15c/ton. Total maintenance cost
High alumina	Andalusite	Inspection and patching on Saturday	1000 to date. Another 200 expected.	Manufacturer's instructions	Andalusite wash	Door section and roof	No figures but very minor expense
Furnace maker's special brick	No patching		2500	2 days electric with resistor. 1 day—gas flame	None		Not available
Furnace maker's lining	Special cement	Rarely	1200	72 hrs. dry with electric coil. Then oil torch 5 hrs.	None	None	88c/ton
High alumina firebrick. 4" insulation	Sillimanite patch	Weekly	Original lining. 1539 to date. O.K.	Manufacturer's instructions		Spout and end walls	
High alumina. 1" Sil-o-cel. 4" Sil-o-cel in 750 lb. furnace	High alumina cement	Patch weekly	350 lb.—1400 aver., 250 lb.—1000 aver.	Charcoal fire. Arc preheat. Line Saturday and melt Monday A.M.	None	Section over door and end walls	350 lb.—new lining —30c/ton. Doors 3c, patching 42c/ton. Total 75c/ton. 250 lb.—52c + 3c + 64c. Total $1.19
Special cement rammed in			Not stated				No data given
High alumina	Special cement	After 2 week operation — daily around spout	1600	Intermittent electric arc	None	Spout	Not available
High alumina	Special cement	Every second day	200		None	None	$3.57 new lining. 89c maintenance. Total $4.46/ton
High alumina originally. 1" insulation	Si carbide cement	Patched every night. Washed with Si carbide cement	26000-28000 on each of 3 furnaces. Life is indefinite	Wood and charcoal fire 4 hrs.	Wash with silicon carbide cement	Roof	Refractories and labor 28c/ton total
Mullite lining	None		500. 500,000 lbs. aver. production	Heated with gas burner	None	None	80c/ton

The largest foundry user of this type furnace melts both red and yellow brass—72-3-25 and 85-5-5-5 mixtures. It is not indicated what percentage of each constitutes the total melt. The refractory used in this case is a Mullite material and the melting schedule in 24 hours per day. An average production of 500,000 pounds (500 heats of 1000 pounds each) is obtained per lining, resulting in a refractory cost of 80c per ton.

The other three users of this type furnace report melting the following alloys:

Cu %	Sn %	Pb %	Zn %
85	2.5	1.50	11
76	3	3	18
81.5	3	7	8.5
84.0	3	3	10

As shown in Table II, cost figures were given in only 4 cases —29c per ton for one of the yellow brass installations which appears to be the cost of material only for new linings; 80c per ton in the case of the 24 hour per day installation, melting both

Table II. Data Reported by Ajax-Wyatt Furnace Users

Response Number	Alloys Melted	Linings Used	No. of heats Obtained	Tons Melted per Lining	Material Cost	Cost per ton of metal
18	Yellow brass 32% Zn	Ajax	1200	540	$155.00	$ .29
25	11 to 18% Zn	Ajax	1200	450		
39	Red brass 8-10% Zn	Preformed Prefired firebrick	1700	510		.55
55	Yellow brass 25% Zn	Ajax YB108	2500	1250		
56	Brass and Bronze	Ajax	1200	396		.88
59	Yellow brass 32% Zn	No. 26 High temp. cement				
63	25% Zn alloy and red brass	Mullite	500	250	$200.00	.80

red and yellow brass; and 55c and 88c per ton of metal melted respectively in the 2 other cases melting 8-18% Zn alloys with 1.5 to 7.0% Pb, pouring temperatures of which range from 1900° to 2200°F.

The installations melting red brass report from 500 to 1700 heats per lining, the charges ranging from 600 to 1000 pounds each. The tonnage per lining ranges from 250 to 510 tons.

The installation reporting 1700 heats per lining uses 600 pound charges, melting the medium red mixtures. The refractory materials used in this case are preformed, prefired blocks with special cements containing chrome ore.

Each concern reports that either no patching is possible to the body of the lining throughout its life or that very little patching is accomplished—the latter being usually around the charging door section.

ANALYSIS OF DETROIT ROCKING ELECTRIC FURNACE RESPONSES

The Detroit furnaces upon which reports were received are classified as to size as follows:

Table III.

Furnace Size	Number of furnaces represented
500 lbs. capacity or smaller	99
500 to 1000 lbs. capacity per heat	21
1000 to 2000 lbs. capacity per heat	5
2000 lbs. per heat and larger	4

The operations reported include red and yellow brass and bronze, bearing metals and nickel alloys. The products so made include valves, meter castings, automotive parts, hardware, ornamental work, fire and rubber goods castings and railway maintenance parts.

It will be seen that the reports on lining life range from 200 heats per lining to 28,000 heats, several users reporting indefinite lining life without shut-downs for relining; also that the total refractory cost varies from 25c per ton of metal melted to several dollars per ton.

This enormous variation in lining life and maintenance expense or total cost on the same general type of melting operations with furnaces of comparable capacities and operating conditions leads to the certain conclusion that much depends upon the human element in securing satisfactory refractory performance.

For purposes of analysis, the reports may be considered in groups as shown in Table IV.

In each case where a concern reported separately on more than one size furnace, each such report was treated as a separate response in the following grouping:

Table IV.

Group No.	Average number of Heats obtained per Lining	Number of concerns so reporting	Individual Refractory Costs reported per ton of metal*		
1	Less than 500	3	$4.46	$2.10	
2	500 to 1000	8	1.87	.35	$ .70
			.40	.91	.90
3	1000 to 2000	27	.82	.25	.60
			1.75	.43	.37
			.54	.69	.78
			.32	.62	.64
			1.19	.94	1.23
			.36 plus patching		
			.36 plus patching		
4	2000 to 3000	10	.42	$ .45	$2.16
5	3000 to 5000	3	.16 plus patching cost		
6	5000 to 10000	5	.11 plus patching cost		
				$ .26	$1.08
7	Over 10000	2	.285	.28	
8	Lining life indefinite	9	.28	.15	maintenance costs

*The cost figures in this column represent in each case individually reported total costs for material and labor, both new linings and patching, unless otherwise noted. The figure is included for each concern reporting on cost.

It is apparent that the lowest total refractory costs are enjoyed by those concerns who have mastered the art of patching or maintaining a furnace lining in constantly satisfactory operating condition, thus avoiding the necessity of frequent relining. Some of these concerns not only obtain thousands of heats per lining but approach, or actually attain, the condition of indefinite lining life. A number of users of this type furnace are certain that they will never have to shut down for a complete relining operation. They thereby avoid loss of production and eliminate the need of carrying spare shells to meet such a contingency. That they are correct in their attitude towards this matter seems to be borne out by the fact that their furnace linings are maintained in perfect operating condition month after month over a period of years.

The vast proportion of furnace users, however, have not attained to that degree in the art of lining maintenance. As will be seen in Table IV the largest number of users (group 3) report in the range of 1000 to 2000 heats per lining, with the second largest group (group 4) reporting 2000 to 3000 heats. A number of concerns are included in the groups between 2000 and 5000 heats who have not yet replaced their original linings. Doubtless many, if not most, of these concerns, through having established a satisfactory patching procedure, are on the way towards effecting permanent lining life from the standpoint of production shutdown for relining.

In considering Table IV, it would be misleading to consider only the number of heats per lining without regard to furnace size. The smaller units are more easily maintained and a larger number of heats per lining are necessary to secure suitably low refractory cost per ton. One thousand heats per lining with the 2000 pound or 3000 pound furnace may be a much more creditable performance than twice that number of heats with a furnace of 750 to 1000 pounds capacity per heat.

In the ultimate analysis the total cost of the finished product is the important factor. Refractory costs constitute a part of this total. They may be conveniently expressed as a certain amount per ton of metal melted, this amount including material and labor for new linings and maintenance throughout the life of the linings, being so stated wherever possible throughout this report.

In addition, however, refractory performance has a further bearing on ultimate cost through a number of secondary influences. Shut-down for relining is a matter that has already been mentioned. The expense of loss of productive capacity is obvious. Furthermore, the furnace installation producing a relatively small number of heats per lining usually has its linings in questionable condition. There is an uncertainty as to how long the lining will run, whether failure will take place and necessitate shut-down during the middle of the week, and patching expense is usually, though not always, excessive. The important point it is desired to make here is that the concern having so developed its patching technique as to keep the linings in perfect operating condition from week to week (through suitable week-end patching and morning inspection, or otherwise) accomplishes a number of important objects in securing low ultimate production costs. Direct refractory costs are lower, shut-downs are eliminated, a more efficient production schedule is maintained throughout each day and each week through the knowledge that the furnace linings are in an unquestionable condition, thereby permitting maximum speed of melting and an uninterrupted production schedule.

In Table IV, the replies are classified in accordance with the number of heats obtained per lining. It was pointed out that this classification loses much of its value unless considered in conjunction with the furnace size or refractory cost per ton of metal melted. Accordingly the furnaces are classified in Table V according to reported total refractory costs per ton of metal melted.

Table V.

Reported Refractory Cost per ton of Metal	Number of Concerns so reporting
Less than $ .30 per ton	8
$ .30 to $ .50	7
.50 to .75	5
.75 to 1.00	5
1.00 to 1.25	3
Over $1.25	5

In analyzing the reasons for the wide diversity in unit costs, we are compelled to recognize the fact that the most important single factor is the human element. The foundry personnel either has or has not the "knack" of patching a furnace lining efficiently, easily and with dependable assurance that it is in perfect operating condition. While the methods and rules for proper patching can be simply stated, and while such information is generally available to all furnace users, actual refractory results vary out of all proportion to the severity of service conditions. The plant securing only moderately good lining life and medium refractory costs may be as well managed and have just as intelligent attention paid to refractory methods as other concerns securing much more economical refractory results.

To assist in illustrating this point, it is desired to compare Responses 36 and 43. Both of these concerns manufacture light, thin-walled castings for valves and other pressure goods. The report received from each is known to be extremely accurate for each of these concerns operates an unusually efficient, well-managed foundry of the highest type. In each case the alloys melted are red brass and bronze. No. 36 reports pouring temperatures of 2175° to 2250°F., while No. 43 reports 2250°F.

Operation is 9 to 10 hours per day in each case and the charges are clean. No unusual difficulty is reported in either case with building up of slag in the furnace hearth. The only difference in the charges is that No. 36 melts 20% of clean dry chips, whereas No. 43 uses no turnings in the foundry charges. Each concern uses the same make of high-alumina fire brick in preformed, prefired shapes.

No. 36, operating 3 furnaces—

One — 75 Kw. — 250 lb. furnace
One —150 Kw. — 350 lb. furnace
One —200 Kw. — 900 lb. furnace

reports refractory costs as follows:

	250 lb. fce.	350 lb. fce.	900 lb. fce.
New lining costs	$ .38	$ .51	$ .40
Patching costs	.40	.40	.50
Total costs per ton	$ .78	$ .91	$ .90

As an illustration of the accuracy of these figures, it is noted that they comprise the average of the last 10 linings used in each type furnace as follows:

250 lb. furnace—1325 heats per lining—331,000 lbs.
350 lb. furnace— 697 heats per lining—313,000 lbs.
900 lb. furnace— 915 heats per lining—823,000 lbs.

Compare the above results with those of No. 43 as follows:

Operating 8 furnaces — 125 Kw. — 350 lb. each.
7 furnaces average –6600 heats per lining on bronze.
1 furnace averages –2000 heats per lining on Monel Metal, nickel and nickel alloys.
Patching cost (material and labor).....$ .20 per ton
New lining cost (material and labor)..... .06 per ton
Total .....$ .26 per ton

In each case the similarity of practice extends even to the use of the same patching material, a high temperature patching cement which is a calcined kaolin.

Assuming proper furnace operation in each case, i.e. correct rate of power input, correct rocking of the furnace during melting, etc., it would seem that the great difference in heats per lining and total cost might be due to the method of applying patches. No. 43 gives no detail on patching method except to state that patching starts after 400 to 500 heats have been produced on a new lining. This fact in itself predicates some condition conducive to long lining life other than correct patching of furnace linings. Is this due to clean charges with no sand on the gates and no turnings used in the furnaces? Is it due to a moderately low rate of input (120 Kw. input being carried in the 350 lb. Detroit furnaces of Respondent No. 43), thus protecting the linings against abnormal punishment; or is it due to a special method using unusual care in drying out and seasoning new linings preparatory to their being put into service? It may be that the result noted is a combination of the above conditions. We should like to point out that No. 36 states that the high temperature patching cement is trowelled into place, the cracks filled and thoroughly washed. We are inclined to think that much better results would be obtained by tamping firmly into place (even to the extent of using an air rammer where possible) rather than by trowelling. It will also be necessary and desirable to use the cement in dryer form when tamping or ramming.

Response No. 52

It is desired to call attention to Response No. 52 which is undoubtedly one of the most satisfactory and economical refractory installations in the entire list. This concern reports indefinite lining life. For the first several years of this installation 7500 to 8000 heats per lining were obtained. Latterly from 10000 to 12000 have been obtained and the present situation is that each week-end the linings are put into perfect condition for the ensuing week's run.

The furnaces are 150 Kw. —350 lb. each. Four furnaces are used. The product being valve castings just as in the case of Nos. 36 and 43 previously discussed. The original linings in these furnaces were identical with those of Nos. 36 and 43—namely high-alumina fire brick, but in the case of No. 52, the original lining material has long since been lost sight of due to repeated patchings. The present linings in these 4 furnaces are the composite result of the materials rammed into place over week-ends during the past several years. The material used is a mixture of gannister and fire clay in the ratio 2:1. The materials are cheap, thus permitting extensive patching at very low material cost. The total cost of refractory maintenance is

Refractory materials	$ .153
Labor	.132
Total cost per ton	$ .285

Note that No. 52 carries an input of 150 to 160 Kw., thereby disposing of one of the possible explanations of the superior showing of No. 43 in comparison with No. 36. Note also that No. 52 charges 25% of dry turnings and thereby disposes of the other possible claim which might be entered against the good showing of Number 43.

In other words, No. 52, melting red brass and bronze, pouring pressure castings at 2250°F., carrying a high rate of power input for rapid melting (18 heats, 375 lbs. each per furnace per 9 hour day) and using a substantial amount of borings and scrap in the charges, using cheap refractory patching materials averages a cost of $ .285 per ton and attains the condition of having indefinitely long lining life, eliminating all question of shut-downs for relining operations.

As shown in the tabulation of responses, a number of makes and types of refractory linings are used. Several concerns use special materials such as graphite fire clay or silicon carbide fire clay preparations. By far the largest number use high alumina fire brick linings, although an increasing number are adopting Mullite or Sillimanite products.

The patching materials used include more than 20 different brands or types of refractory cements and ramming mixtures as shown in the tabulation attached, most prominent among these being Andalusite or Sillimanite and other high alumina high-temperature refractories of either Mullite or aluminous oxide type. It is of interest to note that among the half dozen concerns reporting the very lowest total refractory costs per ton of metal, each one uses a different patching material and has standardized on his own method and materials for furnace maintenance.

With regard to furnaces of larger capacity where the problem of long life and ease of maintenance is admittedly more difficult than with smaller units, it is desired to compare the refractory costs of these furnaces in view of the fewer number of heats obtained per lining.

Responses of users of the larger capacity Detroit furnaces indicate costs as shown in Table VI.

Table VI.

Response No.	Furnace Size	Alloy Melted	Number of heats obtained per lining	Total Refractory cost per ton
5	800 lb.	Bronze	700 to 1100	$ .35
7	1000 lb.	High lead	1400	.36 plus patching
8	3-2000 lb. 1-1500 lb. 2-750 lb.	High lead Brass & Bronze	1000 1000 1000	Average $ .25 per ton
57	750 lb.	Bronze	1539 plus Still in perfect shape	
13	800 lb.	Bronze	2200 to 3000	
17	4-800 lb.	Red Brass	1000	$ .82 Total (.63 Linings .19 Patching)
22	750 lb.	High lead	350	2.10
27	3-800 lb.	Red Brass	1600	.12 patching material and labor
36	900 lb.	Red Brass	915	$ .40 linings .50 patching .90 Total
37	1-2000 lb. 3-1000 lb.	Red Brass Red Brass	800 1200	

It thus appears from Table VI that while furnaces of 800 to 2000 lbs. capacity per charge do not produce the high average number of heats per lining that are obtained with the smaller units, the net costs reported for total refractory expense are on a very satisfactory basis, several of these being among the best reported.

A considerable further improvement is promised, however, by reason of the great progress made during the past 2 or 3 years in the use of monolithic linings of high temperature refractories in this type furnace for melting ferrous metals and superheating to 3000°F. and above.

Melting conditions and refractory service are infinitely more severe in iron foundry operation than in the case of any brass foundry requirement. The lining is constructed by driving the "ramming mix" into place as hard as possible with air rammers in accordance with well developed methods. Linings of this type are now in service in furnaces of 2000 to 3000 lbs. capacity, operating at high rates of power input, melting and superheating cast iron and iron alloys to above 2900°F. and have been operating from 12 to 15 months, an average of 12 hours per day, without interruption for relining or loss of any production on account of refractories. Several of these installations have attained the condition of indefinite refractory service without shut-down for relining.

This is accomplished by correct patching methods and is mentioned here with the thought that it may well be put into effect in brass foundry operation, thereby further enhancing the economy of the electric brass melting furnace.

It may be well to emphasize once more that exceptionally favorable results are usually due to the personal skill of the men who install the linings and keep them in repair. On the other hand, moderate skill, coupled with the use of simple, well known practices and precautions, is sufficient for the attainment of a very satisfactory refractory performance.

Howard McClelland, for the past 20 years connected with the open-hearth department of The Republic Steel Corporation, has joined the sales organization of Basic Dolomite, Incorporated, as service engineer. His headquarters are located at the general office of the company, 845 Hanna Building, Cleveland.

Steel and Tubes, Inc., Cleveland, Ohio, announce the following changes in personnel:

A. V. Grove has been transferred from the Cleveland office to the Chicago office in the Sales Department.

R. E. Doyle is now sales correspondent in the Cleveland office.

J. F. Keeler is now sales engineer with headquarters at the Cleveland office.

Editorial Comment

(Continued from page A 13)

with air cooling) as one legitimate method of annealing. And in the following year the term "full annealing" was originated and authenticated to identify the annealing operation when performed under furnace cooling conditions.

A lot of water has gone over the dam since the technical world was made cognizant of the joint committee's conclusions, confirmed by the coöperating societies. There has been general acceptance. Actuated by important commercial considerations, some persons who did not at first like the term "full annealing" have consistently used it and advocated its use as recommended.

Metallurgists are regarded as queer people by some folks. This impression may be the result of some Victorian tendencies. There are metallurgists who still insist on obsolete distinctions in the use of scientific terms. Recently there was published an article written by a metallurgist who dwelt at length on the fact (so declared) that normalizing is not annealing, and that great confusion results from using the term "annealing" improperly to include normalizing. The metallurgist insisted that the word "annealing" implies furnace cooling; thus completely disregarding the collective judgment of recognized experts, significantly confirmed six years ago.

The same writer, referring to steel castings, employed the term "elastic limit" for a property ascertained in the product; despite the fact that it has been established for many years that elastic limit is not determinable in cast steel by any known method. Evidently yield point was the property in mind.

Everyone who presumes to criticise takes the chance of digging a pit for himself. This may be the case now. However, the present writer subscribes fully to the policy of *trying* always to employ technical terms according to the latest accepted usage, especially in articles to be published. If metallurgists themselves do not follow this precedure there will never be an end to confusion among shop men. That's important in a very practical sense, when producing material to specifications. Incidentally, correct use of terms for heat treating the steel foundry's product has attained a new and very vital significance with the tentative adoption by the A.S.T.M. last June, of specifications (A148-33T) for alloy steel castings for structural purposes.

To avoid being misunderstood himself, the writer would explain that he was *not* a member of the joint committee that defined heat treatment terms. No personality is involved from any standpoint in this plea for the use of accredited technical terminology.—R. A. Bull

Obituary

J. H. Gibboney, Chief Chemist of the Norfolk and Western Railroad, died in Roanoke, Va., on Oct. 30, following an abdominal operation. Mr. Gibboney was 54 years old. He had been connected with the chemical department of the railroad since 1906; chief chemist since Feb. 1925.

Mr. Gibboney was president of the American Society of Testing Materials in 1926-1927 and was previously a member of its Executive Committee and a vice-president. He had been an officer of A.S.T.M. Committee A-5 on Corrosion of Iron and Steel since 1914; chairman from 1922 to his death. He was one of the six members of the important Committee E-10 on Standards and had been a member of Committee A-1 on Steel since 1913.

Prior to his services with the Norfolk and Western, he was from 1901-1903, assistant chemist in the Virginia Agricultural Experiment Station; 1903-1904, chemist of the Virginia Iron, Coal and Coke Co., and from 1904 to 1906, instructor in chemistry at Virginia Polytechnic Institute and chemist of the Virginia State Geological Survey. He was a graduate of the Virginia Polytechnic Institute.

Perkin Medal Award

Dr. Colin G. Fink, Professor of Electrochemistry at Columbia University, has been selected to receive the Perkin Medal of the Society of Chemical Industry for 1934. The medal is awarded annually for valuable work in applied chemistry and will be presented this year to Dr. Fink for his inventions in the fields of metallurgy and electrochemistry. The selection is made by a committee representative of five of the national chemical societies.

Presentation of the medal will be made at a meeting in New York early in January, details of which will be announced later.

SAVE TIME

Read "Metallurgical Abstracts"

Correction

In the August, 1933, issue of Metals & Alloys, pages 123 to 126 in the article entitled Herculoy—A Copper-Silicon-Tin-Zinc Alloy by Dr. R. A. Wilkins, the caption of the illustration at the bottom of page 126 is in error. The tetrachloride filter was not made for the American Laundry Machine Company but for G. O. Keller, Plainfield, New Jersey.

"Industrial Uses of Stainless Steel" was the title of a talk delivered before a meeting of the American Society of Mechanical Engineers at Cincinnati, Ohio, November 23, by **C. C. Snyder** of the Central Alloy Division, Republic Steel Corp., Massillon, Ohio. Prefacing his address with a brief history of the development of stainless steel, Mr. Snyder then divided the present large number of different types of stainless steel into the proper main groups, giving their general characteristics and properties.

The latter part of the talk stressed the rapidly increasing use of stainless steel in various industries, such as building, meat packing, brewing, automotive and the chemical and allied industries. Lantern slides were used to illustrate a number of typical installations of Enduro Stainless Steel.

Donald J. Reese has been appointed Manager, Foundry Equipment Division of Whiting Corporation, Harvey, Ill. Mr. Reese has been in the employ of the Whiting organization since 1920, and for several years was in active charge of the gray iron and steel foundry at the Harvey plant. Mr. Reese is a member of the American Foundrymen's Association. He has also been very active in local foundry circles and is at present Vice President of the Chicago Foundrymen's Club.

A.F.A. Annual Convention, Exposition and International Foundry Congress, Philadelphia, October 22 to 26, 1934

Executive Secretary C. E. Hoyt announces that the Board of Directors of the American Foundrymen's Association has voted unanimously to hold the 1934 Convention and Exhibition of the Association in Philadelphia, and to arrange a Convention without an exhibition for 1935.

The Executive Secretary also announces that the International Committee of foundry technical association has awarded to the American Foundrymen's Association the honor of holding in the United States in 1934, the Fifth International Foundry Congress and Exposition. The staging of this important event in connection with the annual convention of A.F.A., which is usually held in May, has been set for the week of Oct. 22, a date following the annual conventions of the coöperating European associations.

The Meetings, Exposition, and International Congress will be held in Philadelphia's new auditorium.

The overseas countries, whose foundry associations are members of the Committee on International Congresses include Great Britain, Spain, Belgium, Czechoslovakia, Italy, France, Germany and Holland. The first International Foundry Congress was held in Paris, France, in 1923, the second in Detroit, U.S.A., 1926, the third in London, England, 1929, and the fourth in Paris, France, 1932. Sixteen foreign countries were represented in the attendance at the International Congress in Detroit.

It is the plan of the directors that the 1935 Convention without an exhibit shall be similar in character to the very successful one held at the Edgewater Beach Hotel in Chicago in June, 1927, following the International Foundry Congress held in Detroit in the fall of 1926.

Preferred Orientation Produced by

COLD ROLLING Low Carbon Sheet Steels

Some X-ray Observations

by Wayne A. Sisson*

INTRODUCTION

THE CRYSTALLINE orientation of rolled metals and hard drawn wires were first explained by Uspenski and Konobejewski,[1] Becker and Polanyi,[2] Ettisch,[3] and Mark and Weissenberg[4] and later by Jeffries.[5] These and other investigators have shown that the X-ray patterns obtained from cold deformed metals were due to the rearrangement of the crystallites from a position of random arrangement in the annealed metal to positions of definite orientation, and have given an explanation for the production of such orientations. With the hope of obtaining information regarding the inner processes of plastic deformation, many investigators have since studied the texture produced by various processes of cold deformation. Discussions of these results have been published repeatedly and will not be reviewed.

As pointed out by Wever,[6] the original investigations gave rise to hopes which have been fulfilled only in part due to the contradictory results obtained on various cold-rolled foils. This lack of agreement is accounted for, in part, by Wever as follows: "The macroscopic features of the rolling process show that this deformation is definitely heterogeneous in character and that it is subject to influences from the most varied sources. From this it is clear that the texture will vary from point to point and that it may be affected by such factors as the roll diameter, the reduction per pass, the number of passes, etc. Again various observations[7] suggest that the fine mechanism of the process varies (or may vary) fundamentally in the course of the reduction."

It was thought to be of interest, therefore, both from a practical and theoretical standpoint, to investigate the course of changes in crystal fragmentation and orientation during successive stages in the rolling process; also to study the effect of variables in the raw material and in the technique of rolling upon the establishment of the ultimately attained preferred orientation. It is the purpose of this paper to outline briefly a long series of studies of these problems.

*Résumé of part of thesis submitted by W. A. Sisson to the Graduate School of the University of Illinois in partial fulfillment of the requirements for the degree of Doctor of Philosophy, under the direction of Prof. George L. Clark.

EXPERIMENTAL TECHNIQUE

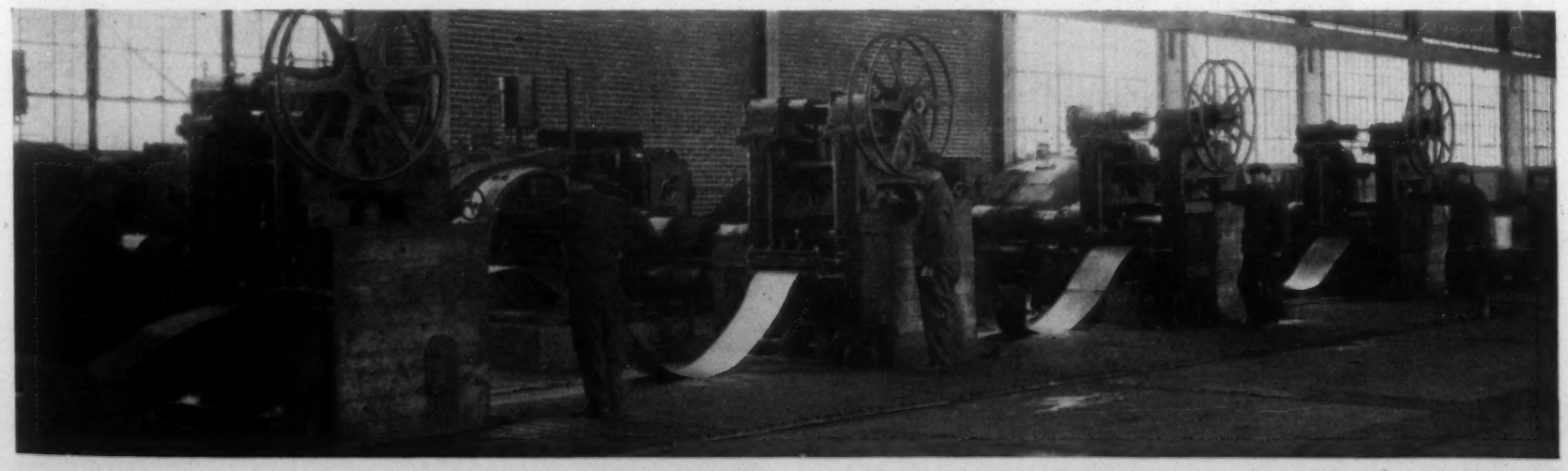
Open hearth low carbon steel, analyzing approximately 0.1% C, 0.4% Mn, 0.04% S and 0.014% P was used in this investigation because of its commercial importance. The majority of samples were rolled on the Steckel type of rolling mill,[8] several on standard types of rolling mills, and a few on small hand-driven rolls.

The methods outlined by Davey, Nitchie, and Fuller[9] and by Polanyi[10] were used to determine the type of fiber structure for the samples examined. The degree of orientation was determined by the sharpness of the intensity maxima, or by direct comparison of the diffraction patterns. The large number of specimens examined prohibited the more quantitative face-pole figures of Wever[33] to be constructed for each sample. An example of the interpretation of the type of pattern obtained from cold rolled steel is given by Clark.[11]

Gough[12] has shown the slip mechanism to be more complicated than originally thought but throughout this paper it will be assumed that slip takes place on the (110) planes.[13]

Apparatus

The X-ray machine was of the type manufactured by the General Electric Company[14] containing a Coolidge tube with a molybdenum (Ka = .71 A.U.) water-cooled target operating at 30 kilovolts and 20 milliamps. In most cases the Laué method employing polychromatic radiation was found to be the most satisfactory for studying preferred orientation. The same pinhole was used in examining each specimen of a series containing a common variable. The specimens were mounted over the outer aperture of the pinhole system with the direction of rolling vertical and perpendicular to the X-ray beam. The photographic film in a flat aluminum cassette was placed 5 cm. from the specimen. In some cases a reflection method similar to that employed by Davey, Nitchie and Fuller[9] was used. In order to carry out quantitative studies on orientation the specimen was tilted at definite angles to the X-ray beam, by employing a special constructed goniometer which allowed the specimen to be rotated ± 50°.

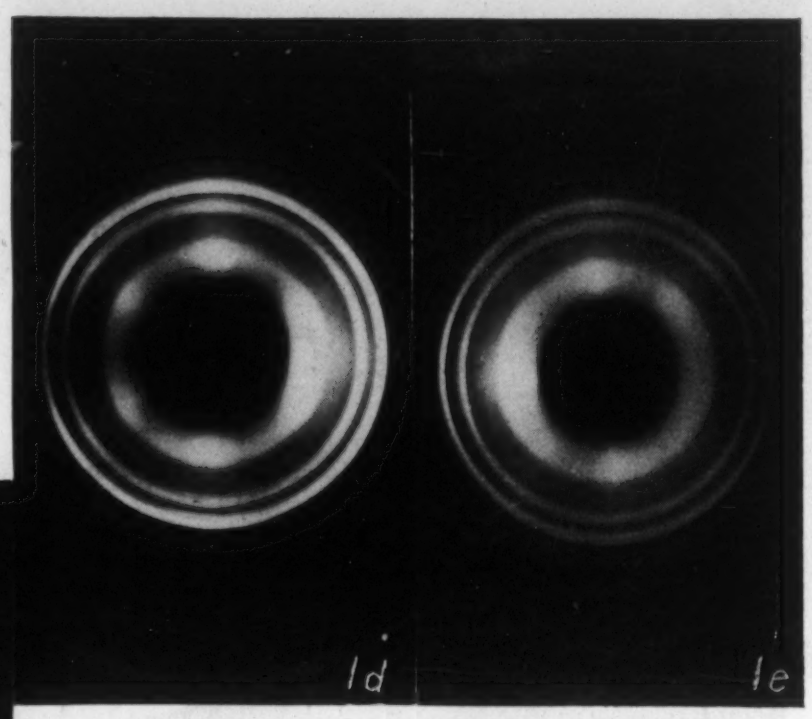


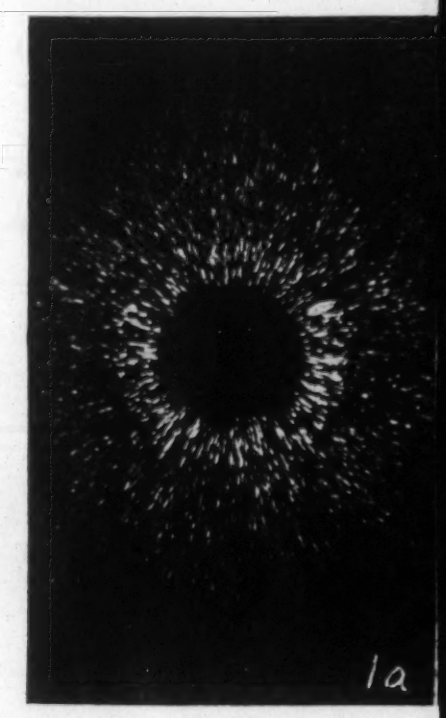
Two-High Tandem Cold Rolling Mills (Courtesy E. W. Bliss Company).

Selection of Uniform Samples

Schmid and Wasserman[15] have shown that drawn wires have a distinctly zonal structure. Similar zonal differences in rolled metals have been reported by Tafel,[16] Niwa and Matura[17] and Thomasson.[18]

In selecting comparable samples for examination some idea of the uniformity of the cold rolled sheet structure is desirable. Transmission patterns of specimens prepared from various zones in a sheet showed that thick samples, having a small percent reduction, had a slightly greater grain fragmentation and preferred orientation near the surface. Thin samples, having a large reduction, appeared to be essentially uniform throughout. It is probable that a greater difference in surface and interior would have been found for driven rolls where the surface resistance is greater than that present for the type of rolls used in this experiment.





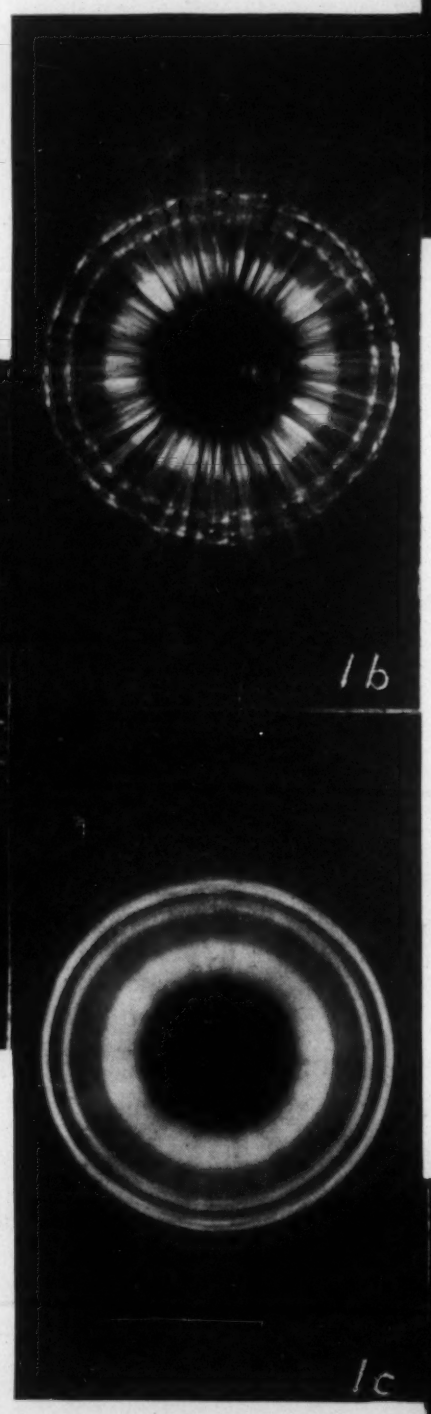


Fig. 1a. Low carbon annealed steel sheet.

Fig. 1b. Same as Fig. 1a, after 7 % reduction in 1 pass.

Fig. 1c. Same as Fig. 1a, after 47 % reduction in 9 passes.

Fig. 1d. Same as Fig. 1a, after 71 % reduction in 14 passes.

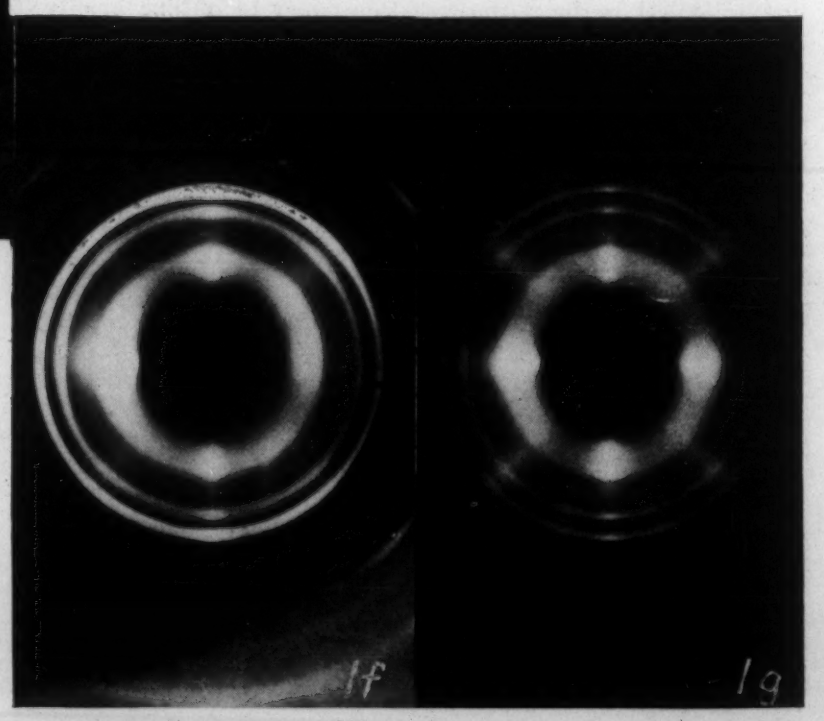


Fig. 1e. Same as Fig. 1a, after 85.5 % reduction in 19 passes.

Fig. 1f. Same as Fig. 1a, after 90 % reduction in 21 passes.

Fig 1g. Same as Fig. 1a, after 97 % reduction in 30 passes.

In order to avoid the "fish tail" effect[19] and to minimize the possibility of a banded structure,[20] which usually occurs near the center of the strip, the specimens examined in this investigation were taken about an inch from the edge of the sheet.

Specimen Thickness

The effect of sample thickness was studied quantitatively in order to obtain information concerning the most desirable thickness to use when taking transmission diffraction patterns of low carbon steel. A set of patterns taken every 0.02 mm. from 0.25 to 0.02 mm. thickness, showed 0.08 to 0.1 mm. to be the most satisfactory. Throughout this investigation the specimens of a given series were of uniform thickness, in most cases about 0.09 ± .01 mm.

Preparation of Specimens

Experimentation showed that cold rolled low carbon steel samples may be etched, filed or ground to the desired thickness without changing the appearance of the X-ray pattern, since they are flexible and severely work-hardened.

Specimens from thin sheets were prepared by etching without serious trouble due to pitting. Warm dilute nitric acid, which acts rapidly, was used to approach the desired thickness, followed by a rough polish with emery paper and the final thickness obtained with warm dilute hydrochloric acid. Specimens from thick samples were ground first on an emery wheel, which was kept cool with water during the process, and then etched to the final gage.

RESULTS

Structural Changes with Successive Reductions

The change in X-ray patterns with successive reductions was studied by rolling several samples without intermediate anneals in such a manner that a section from each pass could be saved for X-ray examination. A list of the 84 samples examined for this study is given in Table I.

Table I.

Series	Reduction	Passes	Final % Reduction
A	.158″ to .005″	30	97
B	.158″ to .01″	36	94
C	.158″ to .01″	13	94
D	.079″ to .0097″	9	88

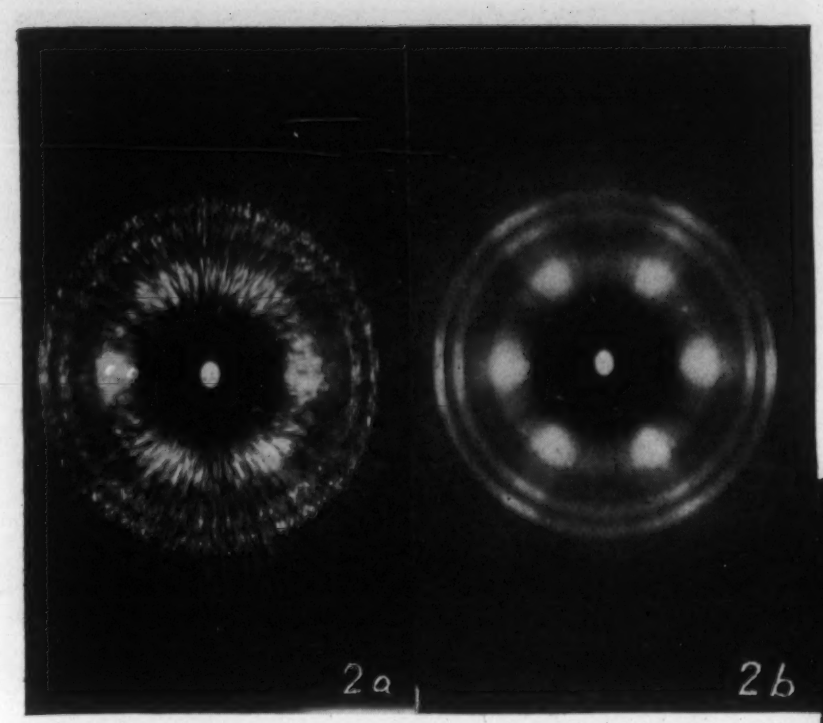


Table III.

Appearance of	Series Per Cent Reduction				
	A	B	C	D	Average
Continuous rings	25	26	35	20	27
Sharply defined rings	31	40	43	27	38
Six-point X-Ray pattern*	70	50	52	45	54
Four-point X-Ray pattern*	83	74	79	70	76

*Six-point and four-point X-ray patterns refer to the number of localized intensity maxima on the innermost band. The six-point and four-point patterns are typical of drawn and rolled structures respectively.

Fig. 2a. Low carbon hot rolled steel sheet with X-ray beam perpendicular to rolling direction and parallel to rolling plane.

Fig. 2b. Same as Fig. 2a, after 16 % reduction.

Fig. 2c. Same as Fig. 2a, after 36.5 % reduction.

The results are represented by Figs. 1a to 1g which were taken from series A. Data concerning these figures are given in Table II.

Table II.

Figure	Pass	Gage inches	Percentage Reduction	Remarks
1a	0	0.158 hot rolled strip	0	Large random grains.
1b	1	0.1475	7	Grain fragmentation and distortion, appearance of diffraction rings.
1c	9	0.084	47	Advanced fragmentation random orientation uniform rings.
1d	14	0.046	71	Appearance of 6 point fiber pattern characteristic of drawing.
1e	19	0.023	85.5	Passing from 6 to 4 point pattern.
1f	21	0.0165	90	Typical rolling pattern, "limited" fiber structure.
1g	31	0.005	97	More perfect orientation.

Here the X-ray beam passed perpendicular to the rolling direction and to the surface of the sheet. Somewhat similar results are shown by a series of reflection patterns reproduced in Iron Age[21] for the successive reduction of a strip of low carbon steel reduced 84.3% in 12 passes.

From the whole series of steel samples the following average results were obtained.

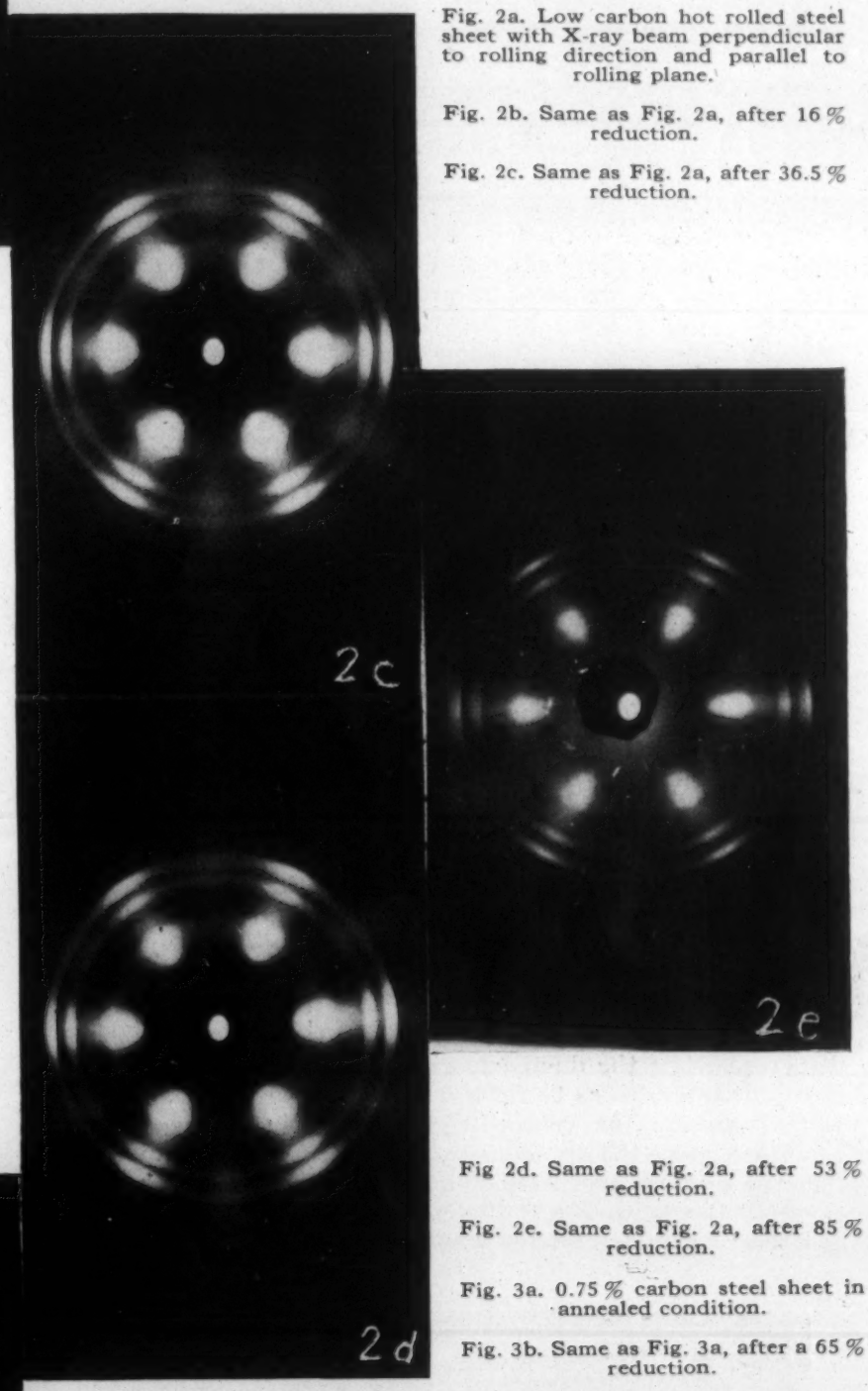
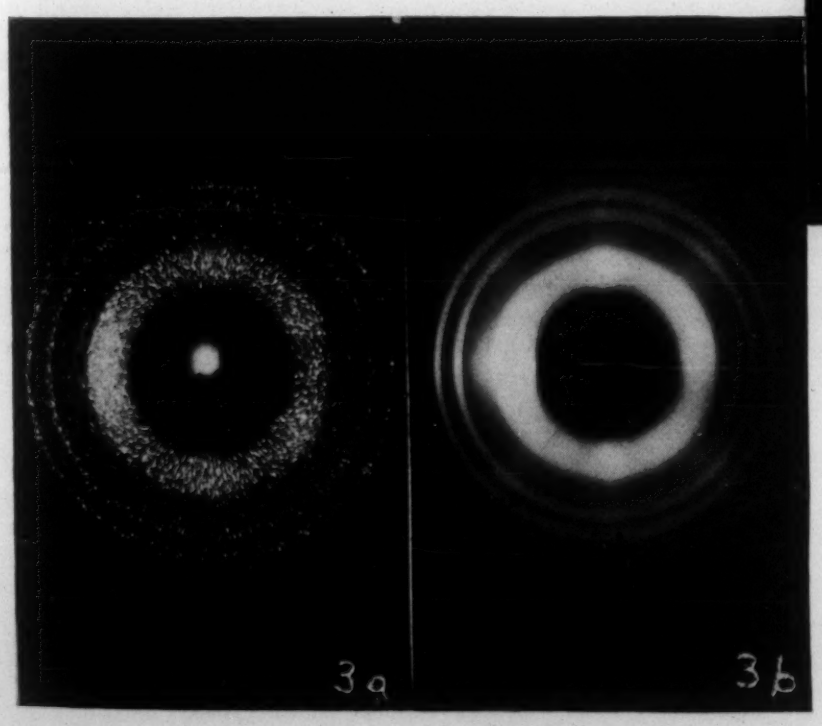


Fig 2d. Same as Fig. 2a, after 53 % reduction.

Fig. 2e. Same as Fig. 2a, after 85 % reduction.

Fig. 3a. 0.75 % carbon steel sheet in annealed condition.

Fig. 3b. Same as Fig. 3a, after a 65 % reduction.



As will be shown later, these values are only representative and will vary, depending upon the chemical composition, thickness, grain size and orientation of the original starting material.

These results confirm those of Tammann[22, 23] who found that in rolling 2 clearly defined changes in crystal orientation can be distinguished: the first in which the force due to rotation of the rolls acts as a stretching force (6-point X-ray pattern), and the second in which the action of the rolls is similar to that of simple compressions (4-point X-ray pattern) and this exerts by far the greater influence on the final orientation in cases of large reductions.

Crystal rotation.—If the X-ray beam is made to pass through the specimen perpendicular to the rolling direction and

parallel to the rolling plane, the rotation of the crystals in the plane of the sheet may be studied. An appreciable rotation may usually be noticed after a 10 to 30% reduction. This gives a six-point X-ray pattern similar to that for cold drawn wires. Norton and Hiller[24] have shown that this type of pattern is to be predicted from calculations. With larger reductions the intensity maxima become sharper and it was found that if the sines of the angles of the arcs formed by these intensity maxima are plotted against the percent reduction the values approach a straight line. Data from a large number of specimens indicate that this relationship holds within an accuracy of about 10%.

Typical X-ray patterns with the beam perpendicular to the rolling direction and parallel to the rolling plane, for reductions of 16, 36.5, 53 and 85%, are shown in Figs. 2a, 2b, 2c and 2d respectively.

Effect of Orientation on Physical Properties.—An attempt was made to correlate the change in physical properties with the change in orientation. In general the tensile strength and hardness increased proportional to the rotation of the crystals and appeared to reach a maximum value as a state of perfect preferred orientation was approached. Curves similar to those given by Pomp and Weichert[25] were obtained.

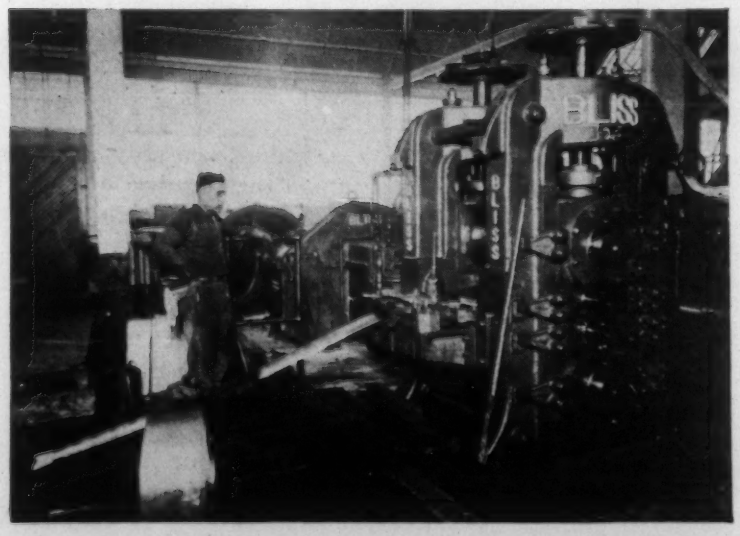
The resistance to further reductions, as measured by power consumption of the rolling mill, was found to increase in the same manner as the physical properties.

These results seem to indicate that the increased tensile strength, hardness and resistance to deformation is partly due to the orientation of the crystals which have changed to positions less favorable for slip and partly due to the small size of the grain fragments which give slip interference.

Effect of Variables in Original Material on Orientation Grain Size.—The effect of grain size in the starting material upon the structure of cold drawn low carbon steel wires has been reported by Clark.[11] Data from several samples showed that the grain size of the starting material has considerable influence upon the structure of cold rolled steel during early stages of reduction, but after large reductions the effect is lost. The smaller the initial grain size, the less cold work is required to produce fibering.

Initial Strip Thickness.—Data from several samples showed that the degree of fibering depends not only on the percentage reduction but also on the initial strip thickness. A sample reduced from 0.08 to 0.01 in. does not show the same degree of preferred orientation as one reduced from 0.04 to 0.005 in., although both have received 87.5% reduction.

Carbon Content.—Most of the previous work on orientation in cold-rolled sheets has been carried out in pure metals. In high carbon steels the pearlite is hard and more brittle than ferrite with the result that when pearlitic steel is cold rolled gliding takes place in a complex manner. The cementite is probably dispersed while the ductile ferrite forms a plastic bond which is not oriented, so as to form a straight fiber structure, but is curved around the cementite particles. The X-ray pattern, therefore, gives the appearance of a more random arrangement for high-carbon steels. Other impurities in iron may have an effect similar to carbon.[11] Plates 3a and 3b show a 0.75% carbon sheet before and after a 65% reduction.



Four-High Cold Mill (Courtesy E. W. Bliss Company).

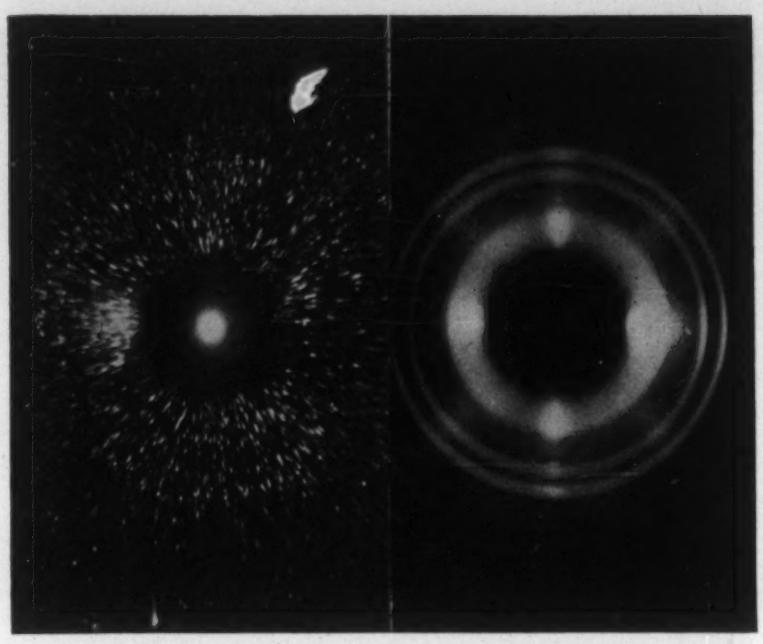


Fig. 4a. Low carbon steel sheet in annealed condition.

Fig. 4b. Same as Fig. 4a, after an 80 % reduction in one pass.

Effect of Rolling Variables on Orientation

Wever and Schmid[26,6,27,28] have reported that the final predominating fibre structure of face-centered metals depends to a large extent upon the type of mill and method of rolling. Hollabaugh and Davey[30] confirmed these results for Al, but not for Cu and Ni. It is of interest to see what effect rolling variables may have upon the orientation of low C steels.

In the following experiments the samples for comparison were obtained from the same original coil so as to eliminate, as far as possible, the effect of composition.

Roll Diameter.—The difference in power requirements, forces set up, etc., for large and small diameter rolls has been discussed by Caswell[19,29] and others. If the diameter of the rolls become infinitely large then the deforming forces under the rolls approach that of pure compression applied normal to the sheet. If they become very small, so that the sheet must be pulled through the rolls, then the deforming forces approach those in a drawing die. Since the type of orientation obtained by drawing is reported to be different from that obtained by rolling, the effect of roll diameter upon the structure was studied.

Comparative tests made with different diameter rolls are listed in Table IV.

Table IV

Diameter of Rolls	Original Thickness	Final Thickness	% Reduction
12″	.089″	.01″	89
2¼″	.089″	.01″	89
5″	.08″	.01″	87.5
2¼″	.08″	.01″	87.5
2¼″	.065″	.01″	84.5
1½″	.065″	.01″	84.5
24″	.08″	.024″	70
12″	.08″	.024″	70

In each case the original material was reduced to the final gage without intermediate anneals. X-ray spectrograms taken of each sample rolled for comparison showed that in every case the degree of preferred orientation was practically independent of the roll diameter.

Speed of Deformation and Reversal of Strip.—Investigation showed that with small rolls the same structure is obtained at rolling speeds from 70 to 800 ft. per minute. The orientation is also the same for unidirectional or for reversed passes through the rolls.

Percent Reduction Per Pass.—X-ray patterns of sheets reduced 87% with 10 to 20% reductions per pass, showed that the final orientation was independent of the percent per pass in obtaining the reduction. This was further proved by reducing a sheet from 0.065 in. to 0.013 in. in one pass, which is an 80% reduction. Plate 4a and 4b show X-ray patterns of this sample before and after the large reduction. A second piece of the same raw material was reduced the same amount in 12 passes and the X-ray pattern of the reduced sample showed the same degree of fibering as that reduced in one pass.

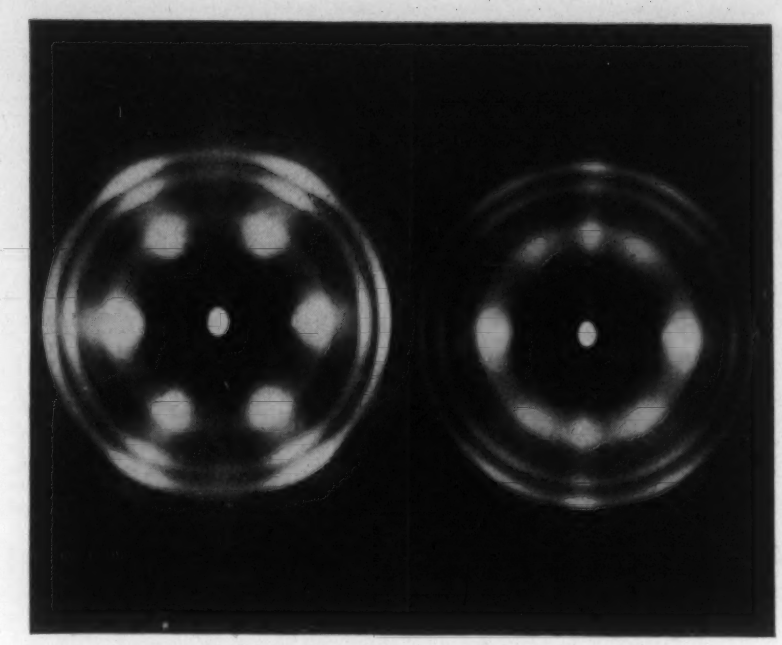


Fig. 5a. Cold drawn low carbon steel wire. Fig. 5b. Same wire Fig. 5a, after 90 % reduction by rolling.

Effect of Deformation Due to Both Tension and Compression on Orientation

In an effort to obtain more information regarding the part which tension and compression play in producing the final orientation in cold rolled steel the following combinations of tension and compression were studied.

Applied Tension during Rolling.—This application of tension was accomplished by employing a mill of the type described in Iron Age,[8] equipped with a special brake which allowed any desired amount of back tension to be applied as the strip passed through the rolls. Strips 2 inches wide were rolled from 0.0775 in. to 0.0095 in. in 12 passes. The pounds tension per square inch in the strip for the 4 experiments tried were: none, 19,750, 30,800 and 49,200. X-ray photographs of each final pass and of each step in the reduction throughout the range where preferred orientation was being established, showed that the application of tension below the elastic limit did not affect the establishment or final degree of preferred orientation.

Effect of Stretching Followed by Rolling.—For this study narrow uniform strips were given various amounts of elongation up to 40%. These strips were then rolled on hand-driven rolls. X-ray patterns showed that the appearance of a limited fiber structure (typical of rolled sheets) could be delayed by elongating the sample by tension before rolling. However, this preliminary elongation did not affect the final orientation after a total 80 or 90% reduction.

Reduction by Hammering and Stretching.—Sheets of low carbon steel were deformed by various combinations of compression and tension. X-ray examination of a large number of samples showed that if a sheet is reduced by compression or tension the metal must flow in one direction if a condition of preferred orientation characteristic of rolled sheets is to be established. If the metal is allowed to flow in all directions the cube diagonals become parallel to the plane of the sheet but have no preferred direction in this plane.

Drawing of Flat Sheets.—In cold drawn wires the crystallites are oriented with respect to the wire axis but are rotated at random around this axis. The question then arises as to whether this type of orientation is due to tension alone or is affected by the process of reduction through a die. If the fiber condition is due to tension alone then a flat drawn sheet should have a fiber structure typical of drawn wire instead of a rolled sheet. In order to test this theory, narrow sheets of low carbon steel were reduced by drawing in a specially constructed die. 50% reduction was the maximum to be obtained by drawing. Investigation showed that the drawn sheets had the same type of fibering as sheets rolled the same amount. These results indicate that *the direction of flow of the metal is the factor which determines the nature of the fiber structure,* rather than whether the material is drawn or rolled. These results agree with those obtained by Norton and Hiller.[24]

Rolling of Drawn Wires.—In order to throw more light upon the mechanism of the establishment of orientation, cold drawn low carbon steel wires having a well defined fibre structure were rolled and the change in orientation studied during the rolling process. This investigation showed that the orientation of the [110] direction did not change during the rolling process, but there was a rotation of the crystallites around this direction until a (100) plane became parallel to the rolling plane (limited type of fiber structure). Plate 5a and 5b show a cold drawn low carbon steel wire before and after a 90% reduction by rolling.

As pointed out by Wever,[6] the relation between the type of preferred orientation produced by tension and by compression does not become evident until we take into account that it is the symmetry of the direction of flow, rather than the axis of symmetry of the applied stress, that is of significance. In drawing wire or in tensile tests, this symmetry of direction of flow coincides with the wire axis (or tensile axis), while in compression or rolling it lies in a plane perpendicular to the direction of compression.

Rolling at Various Angles.—Upon examination of a body-centered cubic lattice we see that it has a 4 fold symmetry around an axis normal to the cube face. Therefore, if the unit cube tends to arrange itself during the rolling process so that the face diagonal is parallel to the rolling direction and the cube face parallel to the rolling plane, the same orientation should be obtained by rolling in 2 directions at right angles to each other as that obtained by rolling all in one direction. Furthermore, cross rolling should cause a condition of preferred orientation to be established with less reduction since the passes at right angles should help to rotate the crystallites into a final position.

In order to test the correctness of the above predictions the following sheets having random arrangement were rolled on small hand driven rolls.

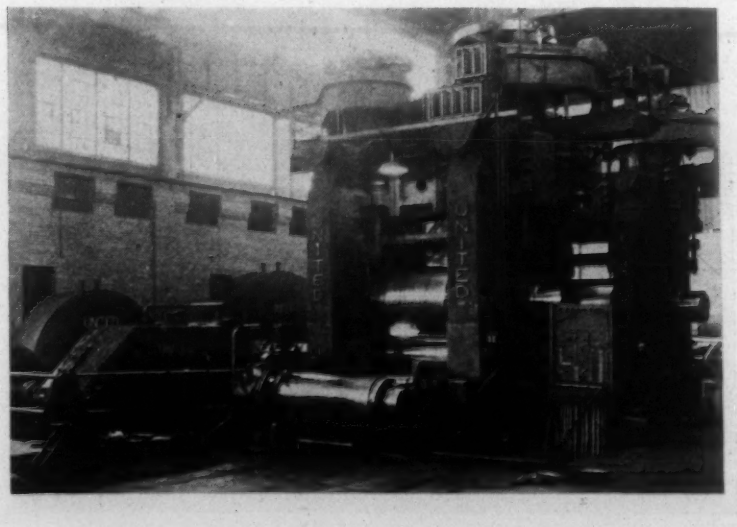
Table V

Original Thickness	Final Thickness	Percent Reduction	Rolling Angle	Directional Properties*	Preferred Orientation
.01″	.004″	60	180°	Present	Present
.01″	.004″	60	90°	Absent	Present
.01″	.004″	60	30°	Slight	Absent
.065″	.0028″	96	180°	Present	Present
.065″	.0028″	96	90°	Absent	Present
.065″	.0028″	96	30°	Slight	Slight

*As shown by bending tests.

The X-ray patterns for the 96% reduction by cross and 30° rolling are shown in Figs. 6a and 6b. The orientation is sharper than that obtained by unidirectional rolling. Examination of intermediate steps showed that the final orientation is established with less reduction for cross rolling.

Von Göler and Sachs[31] studied the rolling and recrystallization structure of copper rolled in various directions. They found that cross rolling gave an entirely new symmetry to the X-ray pattern. This difference between copper and iron is to be expected because of the difference in crystal structure and type of preferred orientation obtained for rolled sheets.



Four-High Cold Strip Mill (Courtesy United Engineering and Foundry Company).

In view of the above facts it is probable that we can further limit our general rule stated above (that the type of preferred orientation depends upon the symmetry of the direction of flow, rather than upon the symmetry of the applied stress) to take into account the symmetry of glide planes in the metal being deformed.

It is well known that the physical properties of cold rolled low carbon steel sheets are different depending upon whether they are determined in the direction parallel or perpendicular to the rolling plane.[32] This difference is usually attributed to the condition of preferred orientation existing within the sheet. However, preliminary results indicate that cross-rolled sheets are almost free from directional physical properties and yet produce an X-ray pattern indicative of almost perfect preferred orientation. The question then arises why should any cold rolled steel sheet having a preferred orientation show directional physical properties. It is probable that the answer to this question may be found in the fact that more glide planes have been used in one direction than in the other. By the way of practical application of the above phenomenon, it is probable that many of the difficulties of certain drawing operations could be remedied if the steel could be made to flow in two directions during the forming operation so as to partly eliminate directional physical properties.

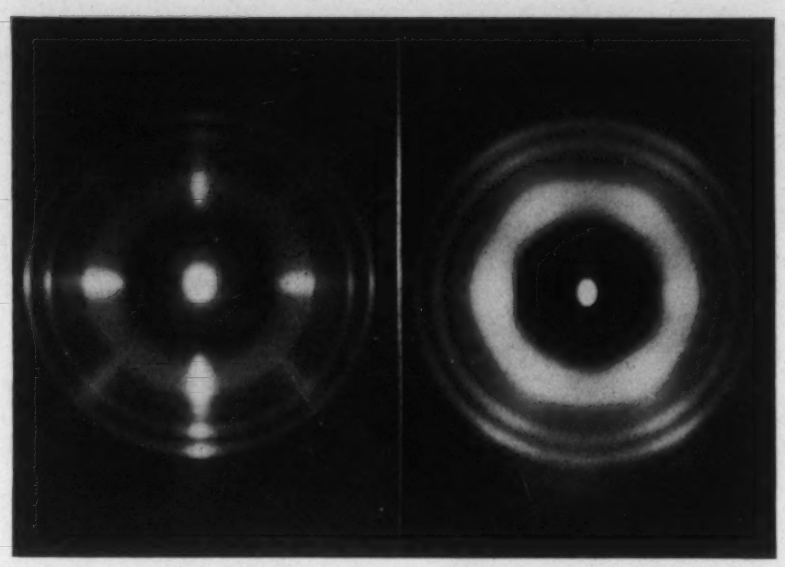


Fig. 6a. Low carbon sheet after 96% reduction with each pass perpendicular to last.

Fig. 6b. Same material and percent reduction as Fig. 6a, but with each pass 30° to last.

SUMMARY

The authors realize that due to the variable nature of low carbon steel, many of the conclusions drawn in this paper may require modification if applied to other materials or experimental conditions. Space has not permitted the presentation of experimental data in detail, but the conclusions in general contribute information concerning the mechanism of plastic flow and the resulting fiber structure as affected by variations in the raw material and method of deformation. The results may be summarized as follows:

A discussion is given of the technique of selecting and preparing specimens for X-ray examination.

The change in orientation of the crystallites of low carbon sheet steel during successive stages of reduction was investigated by X-ray diffraction methods with the beam both parallel and perpendicular to the rolled sheet, and the results of other investigators confirmed.

The relation between orientation and physical properties is pointed out.

The degree of preferred orientation in a cold rolled low carbon steel was found to depend not only upon the percent reduction which the sample had received, but also upon the grain size, thickness and chemical analysis of the original starting material.

Low carbon steel is not very sensitive to differences in rolling treatment, as indicated by the fact that the degree of preferred orientation was found to be independent of the roll diameter, speed of deformation, reversal of strip and the percent reduction per pass.

The application of tension below the elastic limit to the strip during the rolling process does not effect the establishment or final degree of preferred orientation.

The appearance of preferred orientation may be delayed by elongating the strip prior to rolling, but the final type of orientation is not affected.

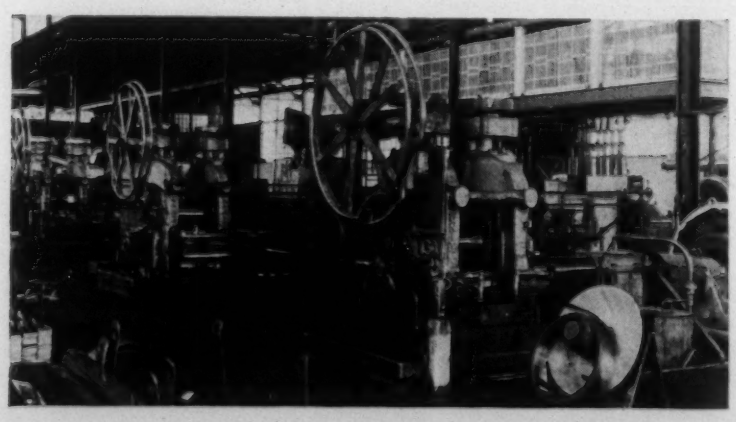
The type of orientation produced by hammering and stretching is discussed.

Sheets drawn through a flat die give the same type of preferred orientation as rolled sheets.

The rolling of cold drawn wires changes the fiber structure from an "unlimited" to a "limited" type.

The results obtained by rolling low carbon steel sheets at various angles and its effect upon directional properties of the sheet are discussed.

The results as a whole confirm the theory that the type of preferred orientation produced in low carbon steel depends upon the symmetry of the glide planes and the symmetry of the direction of flow of the metal, rather than upon the axis of symmetry of the applied stress, or whether the deformation is produced by tension or compression.



Four-High Tandem Cold Strip Mill (Courtesy United Engineering and Foundry Company).

REFERENCES

1N. Uspenski & S. T. Konobejewski. *Zeitschrift für Physik,* Vol. 6, 1932, page 216.

2K. Becker, R. O. Herzog, W. Jancke & M. Polanyi. *Zeitschrift für Physik*, Vol. 5, 1921, page 61.

3M. Ettisch, M. Polanyi & K. Weissenberg. *Zeitschrift für Physik*, Vol. 9, 1922, page 123.

4H. Mark & K. Weissenberg. *Zeitschrift für Physik*, Vol. 14, 1932, page 328; Vol. 16, 1923, page 314.

5J. Jeffries. *Transactions American Institute of Mining & Metallurgical Engineers*, Vol. 70, 1924, page 303.

6F. Wever. *American Institute of Mining & Metallurgical Engineers*, Vol. 93, 1931, page 51.

7G. Tammann & A. Heinzel. *Zeitschrift für Metallkunde*, Vol. 19, 1927, page 338.

8*Iron Age*, Vol. 129, Jan. 14, 1932, page 168.

9Davey, Nitchie & Fuller. *Transactions American Institute of Mining & Metallurgical Engineers, Institute of Metals Division*, 1930, page 557.

10M. Polanyi. *Zeitschrift für Physik*, Vol. 7, 1921, pages 149, 181; Vol. 10, 1922, page 44; Vol. 12, 1922, page 58; Vol. 17, 1923, page 42; Vol. 18, 1923, page 75.

11G. L. Clark. *Metals & Alloys*, Vol. 1, 1929, pages 14, 57, 98, 153, 206.

12H. J. Gough. *Proceedings Royal Society*, Vol. 118 A, 1928, page 498.

13G. Tammann. Lehrbuch der Metallographie. L. Voss Verlag, Leipzig, 1914.

14W. P. Davey. *General Electric Review*, Vol. 25, 1922, page 565.

15E. Schmid & G. Wasserman. *Zeitschrift für Physik*, Vol. 42, 1927, page 779.

16W. Tafel. *Zeitschrift für Metallkunde*, Vol. 4, 1929, page 265.

17Y. Niwa & J. Matura. *Electrotechnical Laboratory Tokyo Research* No. 122, Dec. 1922, page 1. (In English.)

18L. Thomassen. *Zeitschrift für Metallkunde*, Vol. 15, 1923, page 306.

19J. S. Caswell. *Engineer*, Vol. 149, pages 232, 260, 288, 316, 342, 369, 403.

20F. C. Thompson & R. Willows. *Journal Iron & Steel Institute*, Vol. 124, 1931, page 151.

21*Iron Age*, Vol. 126, 1930, page 1221.

22G. Tammann & A. Heinzel. *Stahl und Eisen*, Vol. 48, 1928, page 693.

23G. Tammann. *Journal Institute of Metals*, Vol. 44, 1930, page 29.

24J. T. Norton & R. E. Hiller. *Transactions American Institute Mining & Metallurgical Engineers*, Vol. 99, 1932, page 190.

25A. Pomp & S. Weichert. *Mitteilungen aus dem Kaiser Wilhelm Institut für Eisenforschung*, Vol. 10, Report No. 112, page 301.

26F. Wever & W. E. Schmid. *Zeitschrift für technische Physik*, Vol. 8, 1927, page 398.

27F. Wever & W. E. Schmid. *Zeitschrift für Metallkunde*, Vol. 22, 1930, page 133.

28F. Wever & W. E. Schmid. *Zeitschrift für technische Physik*, Vol. 10, 1929, page 141.

29J. S. Caswell. *Proceedings South Wales Institute of Engineers*, Vol. 42, No. 2, 1926, page 201.

30C. B. Hollabaugh & W. P. Davey. *Metals & Alloys*, Vol. 2, 1932, page 246.

31von Göler & G. Sachs. *Zeitschrift für Physik*, Vol. 41, 1927, page 889.

32A. Phillips & E. S. Bunn. *Transactions American Institute of Mining & Metallurgical Engineers*, Vol. 93, 1931, page 353.

33F. Wever. *Mitteilungen aus dem Kaiser Wilhelm Institut für Eisenforschung*, Vol. 5, Report 32, page 69; *Zeitschrift für Physik*, Vol. 28, 1924, page 69.

Important industrial uses for metals are definable, in the minds of producers, in terms of tonnage, in those of users, in terms of added satisfaction. The small boy will appreciate having louder torpedoes for the 4th of July. Personally, we won't get any great satisfaction from that particular use, but improvement in ammunition hits nearer home. We can utilize that 10 or 15% reduction in "barrel time" on the skeet targets from station 8.

Anything with new and different properties seems destined sooner or later to have those properties utilized, providing the cost is low enough. In metals, eliminating the impurities that obscure the special properties, tedious determination of those properties and then getting the production cost down have to be accomplished before the uses develop.

Those who deal with rare metals and have the patience and the finances to carry them to such a stage may reap a profit. Anyhow, the research men who finally lick the difficulties have had a lot of fun in doing so.

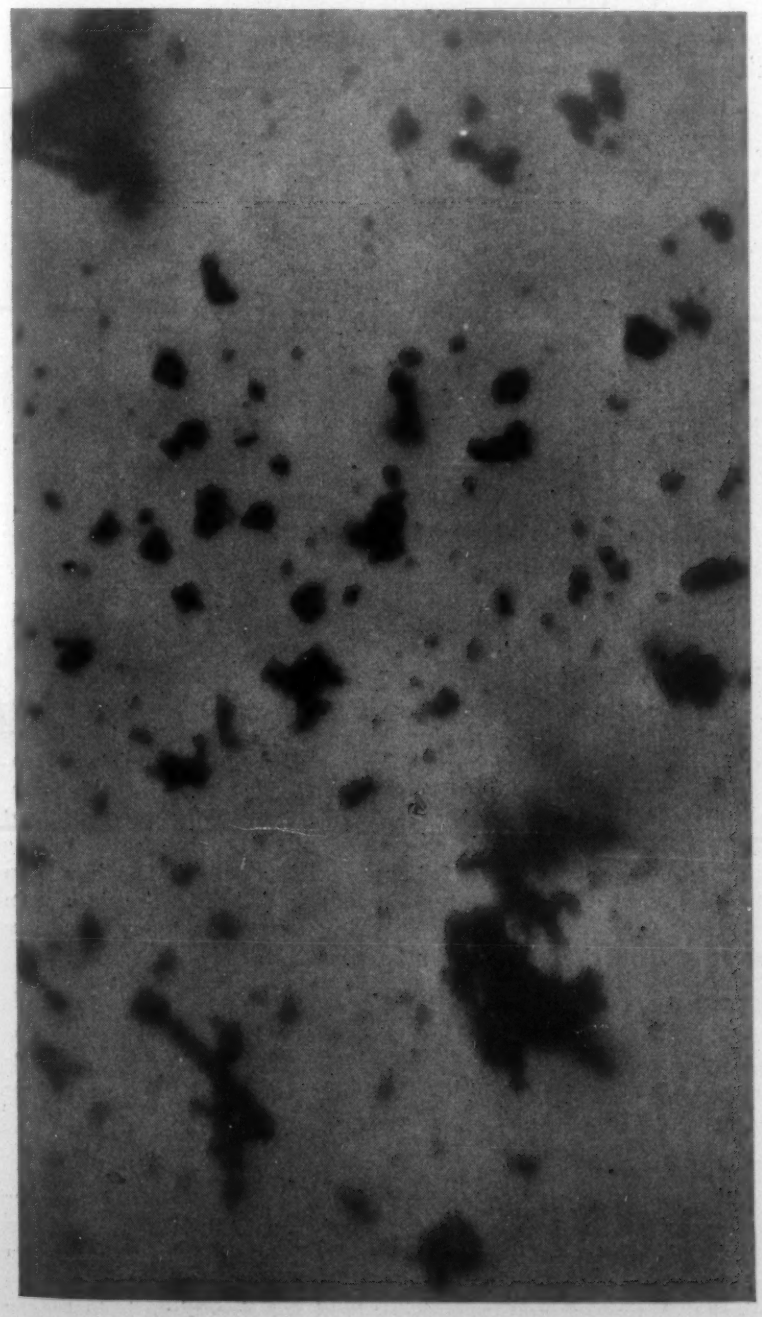


Fig. 1. Zirconium, Grade CM; magnification 2500×; particle size from <0.4 μ to 8 μ.

ZIRCONIUM

by Gordon H. Chambers*

WITHIN the past three years another element has joined the rank of commercial metals. As late as 1929 zirconium sold for $25.00 per lb. and the pure metal had no commercial use. The next year a sudden demand was created when several manufacturers of photographic supplies brought out a new "smokeless" flashlight powder. The new flashlight mixture contained roughly 13½% magnesium, 58% barium nitrate and 28½% of finely divided zirconium metal. The zirconium produced a brilliant flash with high actinic power but, more important, in burning it formed a heavy ash and the flashlight powder was therefore smokeless. Instead of depositing white magnesia dust on the curtains, the ardent photographer now put zirconia ash on the rugs. This flashlight powder became popular and a real market for zirconium metal was created. In response to this an American manufacturer began to produce it. The price dropped to about $8.00 per lb. in late 1930.

However, the infant zirconium industry soon received a severe blow. Photoflash bulbs were introduced and the flashlight powder business almost vanished, taking with it the principal market for zirconium. The photoflash bulbs created a new use for zirconium but a very small one. It is used in the ignition composition which is coated on a fine bridge wire. The mixture flashes when an electric current heats the wire and the flaming zirconium ignites the aluminum foil in the lamp.

Fortunately, the untimely death of the flashlight powder business was only a temporary setback. Other uses for zirconium were developed as the manufacturers gradually realized the unusual properties which the metal possessed.

Physical Properties

Zirconium Metal Powder is extremely fine, screen tests showing only 1% held on 325 mesh. The photomicrograph (Fig. 1) gives a general idea of the structure. The high magnification of the picture shows that the metal particles are extraordinarily small. One investigator estimated that the grains of commercial zirconium metal were only 0.4 μ to 8. μ in size (1μ = 0.001 mm.). An ultra-microscopic examination by the Bureau of Mines showed that the metal was of colloidal fineness and had a marked tendency to form flocculent aggregates. The Bureau reports that many of these aggegates were of sufficient fineness to display Brownian movements in aqueous suspension.

Zirconium metal is stable at ordinary temperatures but will ignite in air at temperatures ranging from 210° to 275° C. The manufacturers and larger consumers of zirconium have found ignition point tests to be the most effective method of checking the uniformity of the metal. The ignition point is proportional to the fineness of the metal particles, the larger grains having higher ignition points. For certain uses an ignition point of 210° C. is preferred and therefore each batch of this grade is allowed a tolerance of about 5°. It must ignite between 205° C. and 215° C. Other grades are controlled in the same way.

Zirconium is black or dark gray in color. It is quite hard, the hardness on Mohs scale being 6.5. The melting point of commercial zirconium is at least 2130° C. and is probably higher. The atomic weight is estimated to be 91.2 or 91.3 which is close to that of molybdenum, 96. Our laboratory recently checked the specific gravity of the powdered metal and reported it to be about 5.855.

Chemical Properties

The chemical stability of finely divided zirconium metal is remarkable. This is, perhaps, its most unusual and valuable property. The metal does not deteriorate in air and in this respect is superior to powdered aluminum, magnesium, the rare earths and almost all other powdered metals. In one test zirco-

*Secretary, Foote Mineral Company, Inc., Philadelphia.

nium was kept in a saturated atmosphere at a temperature of 125° F. for a period of 9 months and at the end of that time it did not show the slightest perceptible oxidation and its physical characteristics were unchanged. At least 10 industrial laboratories have made tests on the stability of zirconium and all of them have found it stable under heat, humidity and when mixed with alkaline salts or acids. It resists the action of hydrochloric and nitric acids in all concentrations and is also resistant to dilute sulphuric acid. Hydrofluoric acid is the only really good solvent for pure zirconium metal.

In sharp contrast to its stability at room temperatures, zirconium is a very reactive metal when heated. It combines with all gases, except the rare gases. It is rapidly oxidized when ignited and burns in less than 0.001 second, liberating a tremendous amount of heat. The heat of combustion is about 1956.7 calories per gram. It has a great affinity for oxygen and is peculiarly efficient in rapidly extracting this gas from somewhat sluggish oxidizers such as barium nitrate.

Other oxidizers which have been used with zirconium are potassium chlorate, lead peroxide, red lead, lead nitrate and the double salt of barium nitrate and potassium nitrate. The relative efficiency of several of these oxidizers with zirconium is shown in the following table of comparative impact tests. The mixtures are loaded into caliber .30 primer cups and tested on a drop test apparatus. In the first test the drop ball weighed 10 ounces and fell from a height of 18 inches. The mixtures were tested in lots of 25, the figures indicating the number in each lot igniting on the first drop, then the number igniting on the second drop, etc.

Series I. 10 oz. Ball Dropped 18 Inches.

	32% Zr Metal 48% $Ba(NO_3)_2$ 20% Granulated Glass	32% Zr Metal 48% PbO_2 20% Granulated Glass
Ignited on 1st drop	13	23
" " 2nd "	1	0
" " 3rd "	0	2
" " 4th "	4	0
Missfire	7	0

This test shows that lead peroxide is a more efficient oxidizer for zirconium than is barium nitrate.

Series II. 8 oz. Ball Dropped 15 Inches.

Oxidizer	Zirconium	No. Tested	No. Fired	No. Squibs
66.6% $KClO_3$	33.3% Zr	100	73	0
66.6% $Ba(NO_3)_2$	33.3% Zr	100	23	13
66.6% PbO_2	33.3% Zr	100	76	0

These tests indicate that potassium chlorate and lead peroxide are about equally efficient as oxidizers.

Production

Raw material will probably never be a limiting factor in the use of zirconium. It is encouraging to know that there are adequate and assured supplies of the ore for many years to come. Most of the ore is mined in Brazil and India but there are also commercial deposits in the United States which have produced several thousand tons. Both the silicate and oxide ores are relatively pure, the metal content ranging from 40% in low grade Zircon to 60% in high grade Baddeleyite. However, no simple method has yet been found to produce pure zirconium compounds from these minerals. The removal of iron and titanium is particularly difficult and expensive. Commercial zirconium dioxide can now be obtained in very pure form but unfortunately the price is relatively high due to the complex process which is used.

Almost all of the investigators have used some form of the thermit process to reduce zirconium compounds to the metal. The oxide and salts have been reduced by potassium, sodium, magnesium, aluminum and calcium. It is not possible to make the metal by reduction with either hydrogen or carbon.

Commercial zirconium metal is quite pure, containing less than 1% of metallic impurities. The chief impurity is zirconium dioxide, as each granule seems to be covered with a thin oxide layer.

Market Price and Packing

The present market quotation for zirconium metal powder is $6.00 per lb. in 100 lb. lots. It is usually packed in new, heavy kegs containing about 35 lbs. of the metal. As zirconium is quite inflammable when dry, large shipments are usually moistened with water and in this state it is inert and safe to handle.

Uses

The commercial uses of zirconium can be divided into two major classifications. The first group comprises various metallurgical uses for the powdered metal. The second group includes a number of fields in which zirconium is employed because it ignites at a relatively low temperature and burns rapidly with a high heat of combustion. At the present time this latter classification is the more important one.

Ammunition Primers

Zirconium is particularly adapted for use in ammunition priming compositions. The most conclusive proof of its excellence in this field is the fact that during the past two years a considerable percentage of the ammunition manufactured in the United States has contained zirconium metal. Several patents have recently been granted and several more are pending which cover the use of zirconium in primers. Its advantages for this purpose are listed below, as each one emphasizes a particular characteristic of the metal.

1. It ignites at a relatively low temperature, about 210° C., which is slightly above the ignition point of mercury fulminate.
2. It has a heat of combustion and flame temperature greatly in excess of any material heretofore used in primers. This makes it very efficient in igniting all types of propellant powders.
3. Zirconium seems to be the only sensitive, finely divided metallic element which does not deteriorate. It is stable in the presence of moisture and does not react with the other primer components. It will not form an amalgam with mercury and therefore does not decompose the mercury fulminate used in many priming compositions.
4. Although quite stable at ordinary temperature, zirconium is rapidly oxidizable when ignited. It burns so rapidly and with such heat that an addition of 5% zirconium in the priming composition frequently effects a marked reduction in "gun barrel time." Barrel time is the interval between the blow of the hammer and the departure of the bullet from the gun. One test showed:

   Barrel time without zirconium — 0.0036 second
   Barrel time with 5% zirconium — 0.003 second
   Reduction in barrel time — 16.7%

   Another test on a different primer composition gave this result:

   Barrel time without zirconium — 0.0051
   Barrel time with 5% zirconium — { 0.0046, 0.0045 }
   Reduction in barrel time — 10.8%
5. Zirconium has marked friction sensitivity.
6. Zirconium, upon burning, produces an oxide which is chemically inert and non-hygroscopic so that it will not cause the corrosion or rusting of gun barrels.

A typical primer composition is given below:

Mercury Fulminate — 40%
Barium Nitrate — 30%
Antimony Sulphide — 20%
Zirconium Metal Powder — 4 – 10%

Flashlight Powder

We have already mentioned the use of zirconium in smokeless flashlight powder. This was first described in German Patent No. 336,004 which suggests the following composition:

9 grams Zirconium Metal
5 grams Barium Peroxide
6 grams Barium Nitrate

However, commercial flashlight powder usually has approximately this formula:

Zirconium Metal — 28½%
Magnesium Metal — 13½%
Barium Nitrate — 58 %

Electric Blasting Caps

The igniting composition in an electric detonator usually consists of mercury fulminate or lead azide mixed with an oxidizer such as potassium chlorate and a binder such as nitrocellulose. Many successful tests have been made in which zirconium was substituted for the mercury fulminate or lead azide. The advantages of using zirconium for this purpose are the same as those listed for ammunition primers. It has been used only to a limited extent in this field due to the danger in changing large scale manufacturing processes over to a new type of explosive composition.

Photoflash Lamps

The use of zirconium in this field has been described in the opening paragraph. A mixture of zirconium and lead peroxide is coated on a fine bridge wire and is ignited by the electric current.

Pyrotechnics

The employment of zirconium in smokeless flashlight powder suggested its use in other forms of pyrotechnics. It has been tested in various military and naval flares, in Very signals, in airplane landing flares, in movie flares and in commercial fireworks. A particularly promising field for zirconium is in tracer ammunition. It has the advantage of being quite stable in a moist atmosphere whereas both powdered aluminum and mag-

nesium deteriorate. Furthermore, it ignites easily, produces no smoke and gives a great deal of light. However, the price of zirconium metal is much higher than that of magnesium or aluminum and this has limited its use to special types of pyrotechnics.

Torpedos and Firecrackers

A considerable quantity of zirconium is used in penny torpedos. When mixed with an oxidizer such as barium nitrate, zirconium has sufficient friction and impact sensitivity to ignite explosively when the torpedo is thrown against a hard surface. Small boys want plenty of noise, and a zirconium torpedo gives it to them. Only half as much of the zirconium mixture is used and yet it produces a louder detonation than the standard torpedo composition. It is also considerably more reliable as it was difficult to control the impact sensitivity of the old mixture.

A new type of firecracker containing zirconium has recently appeared on the market. In this case, the zirconium and barium nitrate are ignited by a fuse and not by friction or impact. Zirconium is also used in several other noise-making novelties.

Portion of the Zirconium Metal Refining Unit Plant of Foote Mineral Company

Zirconium Getters

Because of its high reactivity with gases, zirconium metal powder has been used on a small scale in vacuum lamps as a getter. At a moderately high temperature it flashes and cleans up traces of oxygen, nitrogen, hydrogen, carbon dioxide, water vapor and other common gases. Zirconium is also used in this field because of the vigorous manner in which it reduces and volatilizes many metallic compounds. Thus mixtures of zirconium and caesium dichromate are placed in evacuated radio or photoelectric tubes and the tube is heated. The zirconium flashes, releasing metallic caesium in the lamp.

Metallurgical Uses

Zirconium alloys readily with both copper and nickel and it is probable that its use in Monel, nickel silver and copper alloys will increase in the near future. One example of its present use in this field is in a complex nickel alloy which is used as the electrode for one brand of spark plugs. It has recently been tried in Monel metal to increase the ductility and tensile strength at lower working temperatures. In certain tests from .2% to 1% zirconium was added to the melt and analysis of the finished metal showed from .09% to .44% zirconium content. The results of these tests were said to be very satisfactory. The domestic manufacturer of zirconium metal made a number of zirconium-nickel alloys about a year ago and found that the two metals reacted rather violently.

Zirconium also alloys with silicon, aluminum, titanium, manganese and iron. This last alloy, ferrozirconium of ferrosilicon-zirconium, has been widely advertised and widely used as a scavenger in steel-making. Like its alloys, the pure metal is a vigorous reducing agent and deoxidizer. It has been used on a small scale to degasify a high melting alloy of platinum and other metals. It has also been employed in making aluminum-free metals by a thermit reduction of the oxides.

Zirconium Carbide Tools

Several manufacturers of sintered tungsten carbide cutting tools use small quantities of metallic zirconium. It is mixed with other powdered metals such as tungsten and cobalt and the mixture is then converted to a complex carbide. Zirconium carbide is quite hard and refractory but its principal value in the tool is said to come from its low heat conductivity. A small percentage of zirconium reduces the heat transmission to a considerable extent and suggests that zirconium may have value in other fields because of its heat insulating quality.

Chemical Resistant Metal

A number of possible uses for zirconium have been suggested and tested in this field. The metal powder can be hydraulically compressed into bars, plates or small shapes for acid-resistant and alkali resistant work but so far no commercial applications have been found. As it has a definite and controllable ignition point, its use as a temperature indicator in corrosive baths might be feasible. Zirconium metal powder has also been tested as a catalyst in hydrogenation and in the synthesis of ammonia.

Ductile Zirconium

This article is concerned only with the history, properties and uses of finely divided zirconium metal. This form of metal is not ductile and cannot be rolled or worked into sheets, wire or special shapes. Dr. J. H. DeBoer of Philips Radio, Holland, has developed a thermal decomposition process in which non-ductile zirconium metal powder is converted to zirconium tetraiodide and then decomposed to form a ductile rod of zirconium metal. This ingenious process is now operating on a commercial scale and it is possible to secure zirconium filaments, sheets, rods, spinneret cups and plates. A brief description of the chemical resistance of the ductile metal may interest a number of readers. Sulphuric acid will not affect ductile zirconium. In one test the metal was immersed in 68% sulphuric acid at a temperature of 72° C. and after 100 days the zirconium was still bright and was not corroded. There was no loss of weight during this period. The ductile metal is also resistant to alkalies. As a matter of fact, zirconium is, in this respect, far superior to other metals used in rayon spinnerets. It is not attacked by molten NaOH and is only slightly affected by molten KOH. A test was made by immersing it in 4 N alkali hydroxide at 72° C. and there was no loss of weight or brightness after 25 days. A more complete description of the physical and chemical properties of ductile zirconium is found in an article by Dr. J. H. deBoer.

Summary

There has been a steady increase in the industrial uses of zirconium during its short career as a commercial metal. Its unusual and desirable properties will probably suggest many other commercial applications.

References

J. H. deBoer. Zirconium. *Foote-Prints*, Vol. III, No. 2.

Geka-Werke. Zirconium flashlight powder. *German Patent* No. 336,004, April 1921.

G. H. Chambers. Zirconium Ammunition Primers. French Patent No. 741,994, Dec. 1932. Belgian Patent No. 390,851, Dec. 1932.

Mellor. Comprehensive Treatise on Inorganic and Theoretical Chemistry, Vol. VII, 1927, Longmans, Green & Co., New York.

James Cleary, who has been a sales executive of the Combustion Engineering Company for many years, has been appointed manager of the Philadelphia sales district and will make his headquarters at the company's Philadelphia office, 1616 Walnut Street.

Fred L. Farrell has been appointed manager of the New England sales territory and will make his headquarters at the company's Boston office, Chamber of Commerce Bulding.

G. O. French has been engaged as a sales engineer specializing on sales work in connection with the company's fire-tube boilers and all special shop work such as oil refinery equipment, chemical equipment, special alloy vessels, tanks, plate work, etc. Mr. French was previously New York District Sales Manager of The Air Preheater Corporation, and prior to that was a sales engineer of the Walsh & Weidner Boiler Company.

Chromium-Nickel as a Corrosion Resistant Alloy

(Concluded from November issue)

by Robert J. McKay*

PART III. WORKING PROPERTIES

Forging

The high temperature properties of Inconel adapt it to the production of shapes regularly forgeable in steel. (Fig. 11.) The ordinary precautions as to low sulphur fuels, reducing atmospheres with completed combustion are to be observed as on all high nickel alloys. The major part of the work should be done between 2400° and 1850° F. Light working without tensile or bending stresses can be continued as low at 1600° F. but no work should be attempted between this point and 1200° F. because of low ductility. Below 1200° F. work can be done but should be classed as "cold work."

Rolling and Drawing

In usual production for rolling and forging, Inconel is chill cast into 14"x14" ingots weighing 3,200 lbs. or 10"x10" ingots weighing 1,000 lbs. Ingots are milled, chipped and thoroughly overhauled and hot forged into blooms. The heating temperature is about 2300° F.

Hot and cold rolled sheets and strip and hot rolled and cold drawn rods are produced following much the same practice as in steel. Also cold drawn tubes are produced according to steel practice with especial attention to dies and lubricants.

In cold press drawing of shapes the series of operations and product obtained are roughly parallel with steel practice. Good lubricants and dies are necessary. Heat treated chrome-nickel cast iron, chrome plated steel, or hard bronze dies are suitable for large work and tungsten carbide steel for small work. Power consumption is somewhat higher than in drawing Monel metal and nickel but not as high as the chromium iron alloys. Shapes can be drawn in a satisfactory range (Fig. 12).

Casting

The metal for Inconel castings (Fig. 13) is melted in the electric furnace. The charge is made up of electrolytic nickel and low carbon ferro chrome. Carbon content in the finished casting is kept below .5%, the usual mark aimed for being .25%. The metal is deoxidized with magnesium.

The molds should be made up of a strong open sand which generally should be dried before pouring the metal. Cores should be fairly soft and the core compound should be one that produces a minimum of gas. Risers should be heavy as shrinkage is high and ample provision to take care of this feature must be made. The metal should be poured fast and at the lowest temperature at which it will run easily and fill the mold.

Machining

The alloy is machinable both in the rolled and cast form. In its normal composition without modification for free machining considerable heat is generated in machining. High speed tools are used and should be carefully heat-treated and sharp. Low speeds are necessary for ordinary lathe work. For instance, where with 1/8" cut and 1/32" feed a speed of 70 ft./min. is suitable for Monel approximately two-thirds this speed would be right for Inconel. It machines uniformly and does not drag or stick badly. Sulphur base oil should be used as a lubricant.

Heat Treatment

A considerable range of strength and hardness properties are obtained by proper combination of cold-working and annealing. In its normal composition Inconel does not age-harden and cold-working is the only hardening process.

When heavily cold-worked only the slightest effects on the physical properties are observed in heating up to 1000° F. At about this temperature internal stresses begin to be relieved. They are almost completely relieved by heating 1½ hours at 1400° F. with only slight softening. Softening by annealing begins at about 1400°, is distinctly perceptible at 1600° F., and is reasonably complete in 10 to 15 minutes heating at 1800° F. Above this temperature grain growth is liable to be objectionable although very short heating at 1900° F. will cause complete softening without undue grain growth. The rate of cooling is unimportant as affecting the physical properties and either quenching or furnace cooling will produce proper softening. Quenching in water or dilute alcohol may aid the time control of annealing and will reduce oxidation somewhat.

The furnace atmosphere should be free from active oxygen and should be low in sulphur. Many oxygen compounds, including steam, will produce chromium oxide on Inconel surfaces and even the best atmosphere from the common fuels will produce some oxide. Such oxide is removable chiefly by grinding or pickling. In an atmosphere of dry hydrogen no oxide will be produced but such an atmosphere must be maintained at all times when the metal is over 700° F. to insure complete freedom from oxide. The oxide does not scale off.

Welded joints in Inconel are not subject to intergranular deterioration, and do not require heat treatment to bring out

*In charge of Technical Service on Mill Products, International Nickel Company.

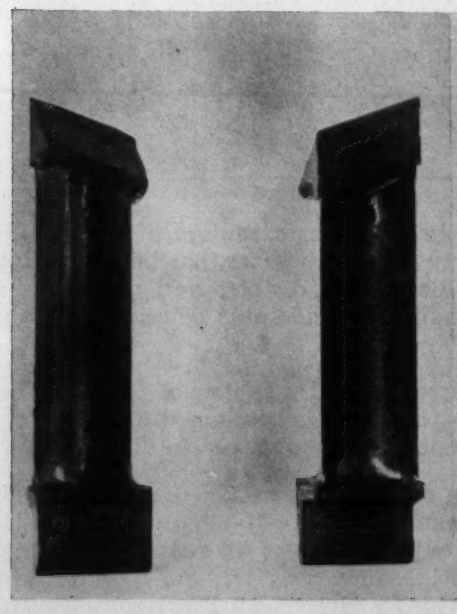


Fig. 11. Turbine Blading as Drop Forged.

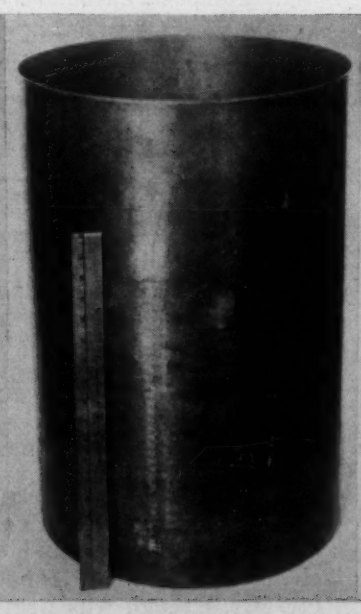


Fig. 12. Cylindrical Drawn Shape. Spun to Size.

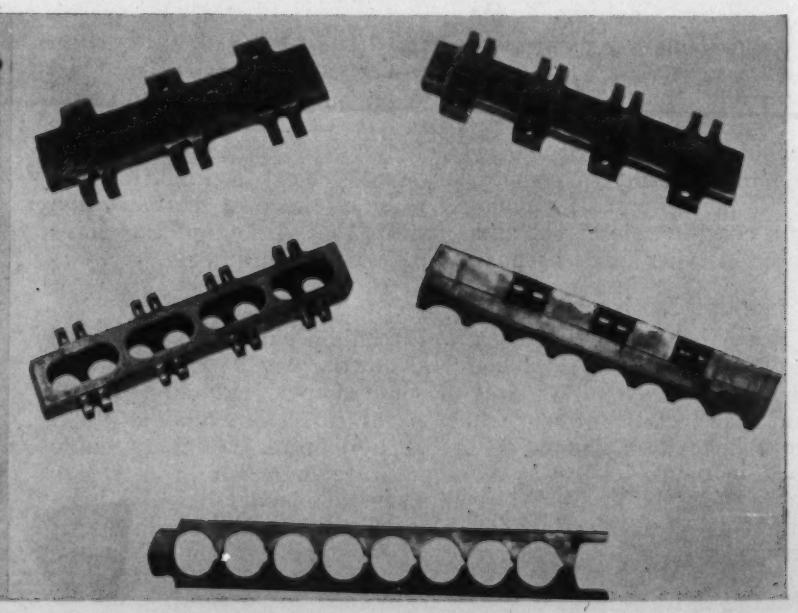


Fig. 13. Typical Header Castings for Milk Circulation unit.

best corrosion resistance. In fact an important characteristic of Inconel is its freedom from the deteriorating type of structure change associated in the case of some chromium-nickel-iron alloys with the heat of welding.

Pickling

The corrosion resistant properties are evident in this process and pickling must be done with active acids combined with oxidizing agents. Oxides are, of course, formed rapidly in the presence of free oxygen and less rapidly in atmospheres where oxygen is in combination with carbon. Oxide formed in an atmosphere containing free oxygen is more easily dissolved than that formed when the oxygen is in chemical combination, since the latter contains a higher percentage of chromium oxide. However, the heavier oxide of oxidizing atmospheres may leave a rough surface after pickling and, therefore, in most cases, the high chromium oxide is produced and must be removed. Hot solutions of dilute nitric acid with the presence of fluorides or chlorides are reasonably effective. Scrubbing the surface during pickling produces more rapid effects and therefore smoother pickling. Paste pickles have been found very useful in handling large plates or where equipment is not available for handling these very corrosive liquids. For such work a mixture of 1 part lampblack, 10 parts Fullers' earth, 25 parts 20° Be′ HCl and 2 parts cupric chloride is a good one.

Joining

The facility with which this alloy may be joined is very useful to the fabricator. Practically any of the standard joining

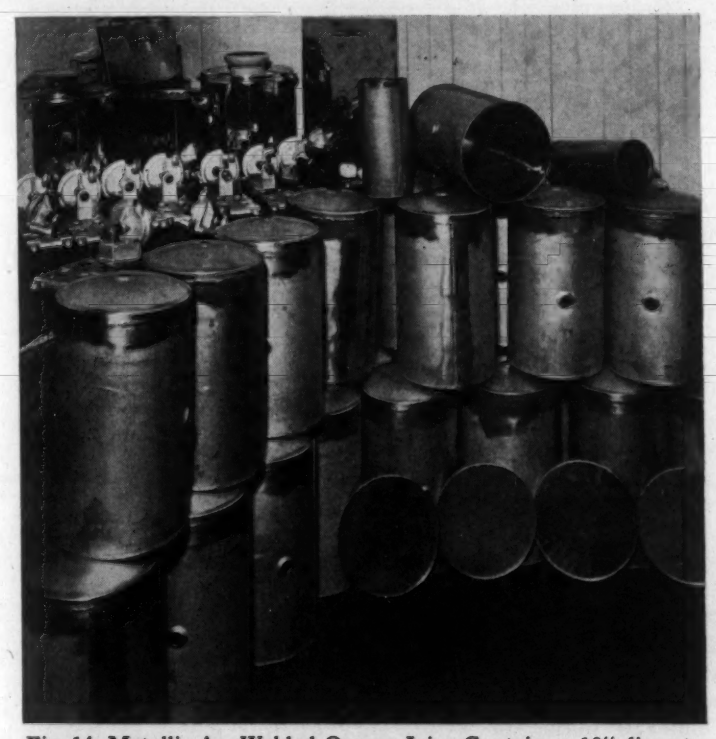


Fig. 14. Metallic Arc Welded Orange Juice Containers 12″ diameter 0.050″ wall.

methods, lock seaming, riveting, bolting, soldering, silver soldering, brazing and welding are readily accomplished.

The facility of welding is particularly interesting in that electric arc welding is easier and produces better results than on pure nickel. Sheet metal of 18 gage and heavier can be readily arc welded. (Fig. 14.)

In the table below are given the results of tensile tests on welded joints in Inconel:

Table VI. Physical Properties of Metallic Arc Welds on 1/8″ Sheet

Type of Weld	Breaking Strength—lbs. per sq. in. Broke in plate	Elongation across fracture %
Unwelded sheet	96,000	47.8
As welded	97,200	31.7
Machined	95,625	34.5

The quality of the weld metal is expressed by the values for dressed welds, in which the weld was machined on both sides not completely flush with the plate. Even in these tests the greater number of fractures occurred in the plate.

The values for the raw metallic arc welds give the strengths obtainable from the joint as a whole, such as would be encountered in practice.

The ductility of welds has been tested thoroughly in bend tests, with the bend across the weld. No fractures occur even when the specimens are hammered back to back along the entire length.

Oxy-acetylene welding (Fig. 15) also produces strong ductile welds. Bare rods are used with a slightly reducing flame or, if oxidation is to be prevented, a flux mixture of boric acid, borax and sodium fluoride is used.

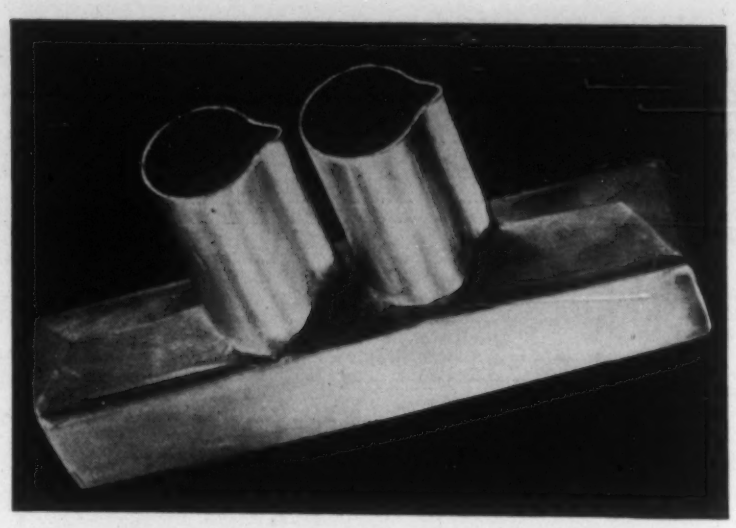


Fig. 15. Milk Cooler End Detail, Welded and Solder Filleted.

Automatic gas welding is well adapted to the production of tubing. By this process tubing is made which is welded completely through but lies flat on the under surface with no projection or "bead." Such tubing can be annealed, drawn, swaged and bent without failure. It approaches the soundness of seamless tubing and is superior to it in uniformity of wall thickness, surface finish and freedom from die scratching or adhering foreign metals.

All ordinary hand gas welding operations, such as flange or edge welding and butt welding of sheets, welding of round sections for chain, etc., are readily accomplished.

Spot and electric seam welding give strong and durable results. "Shot" welding is satisfactory but not necessary to prevent deterioration.

Brazing and silver soldering with the use of the oxy-acetylene torch are useful for joining where the higher temperatures of fusion welding produce buckling or other undesirable effects. This work is usually done with the use of a flux of the same ingredients as are used for gas welding. Joints are usually designed so that the slightly lower physical properties of the filling metals do not produce low structural strength. For instance, a sleeve joint is recommended in tubing with sufficient lap to give adequate strength to the soldered joint. The different corrosion resistance of the brazing or silver soldering materials should be considered in designing such joints. For invisible joints, a nickel bearing brazing rod, such as Oxweld No. 20, is necessary for color matching, or a white silver solder, such as Handy & Harman's RT solder. The high copper brazing materials are not as resistant to many types of corrosion. Properly designed joints are not liable to be seriously weakened mechanically from this cause, but may become visible in time if exposed to corrosive atmospheres or foods without frequent cleaning. Silver solders are tarnished easily by sulphur compounds and neither type of joint can be expected to retain a brilliant lustre as long as Inconel itself. Brazing compounds should have a relatively high melting point, as with Oxweld No. 21 (or No. 20 for white brazing), and silver solders should have a low flow point to insure freedom from cracks which may occur during cooling if molten metals are in contact in the range 1600° to 1400° F.

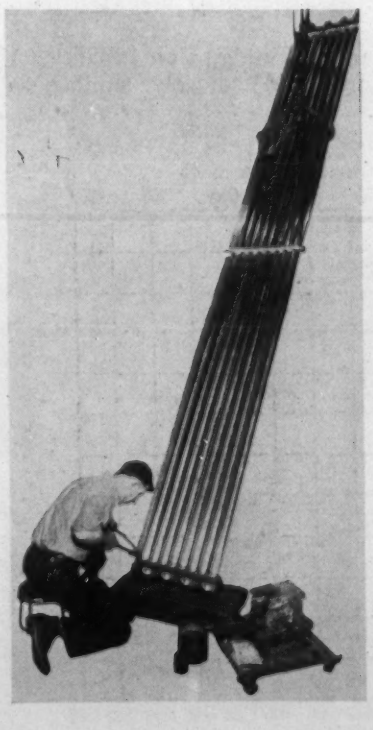


Fig. 16. Soldering Practice, Milk Unit.

Soft soldered or lead filleted joints are useful, for instance in sanitary corners in dairy and chemical equipment (Figs. 15 & 16) and for work where even brazing temperatures are too high. The joints have the usual properties of soldered joints. Thorough bond with the metal must be insured by care, usually by "tinning" with an iron, and the more active fluxes, such as Spear's Soldering Fluid* and Johnson's Soldering Fluid** are recommended.

*Jordan Company, 2326 West 13th St., Chicago, Illinois.
**Johnson Mfg. Co., 729 West Washington Blvd., Chicago, Illinois.

PART IV. PHYSICAL AND MECHANICAL PROPERTIES

Physical Constants

Density	8.55
Co-efficient of expansion	
100°-200° F. range	
per ° F.	.0000064
per ° C.	.0000115
100-1400° F. range	
per ° F.	.00000896
per ° C.	.0000161
Heat conductivity	3.5% that of copper
Specific heat (77°-212° F.)	109
Melting point	
° F.	2,540
° C.	1,388
Modulus of elasticity lbs/in.^{2}	31,000,000

Mechanical Properties

TABLE VII

	Tensile strength lbs./in.^{2}	Yield point lbs./in.^{2}	Elong. %	Red. in area %
Sheet and strip				
Annealed	80- 95,000	30-40,000	45-55	
Rod				
Annealed	80- 95,000	30-40,000	45-55	65-75
Cold Drawn	100-115,000	80-95,000	20-30	
Wire				
Annealed	80-95,000	30-40,000	45-55	
Spring temper	175-200,000			

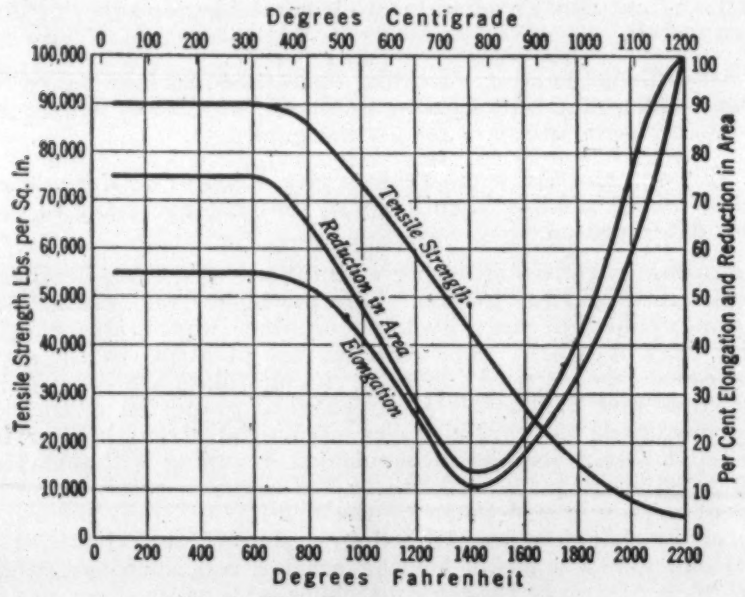


Fig. 8. High Temperature Properties

Inconel is one of the nickel-chromium group of alloys that has the highest resistance to oxidation at high temperature, and as well, the highest degree of strength in the elevated temperature range. It furthermore has the important property of being free from intergranular deterioration in the high temperature range.

The tensile properties of annealed Inconel at elevated temperatures are given in Fig. 8.

Strength tests [Tapsell and Bradley, Eng'g. Vol. 120 (1925) 614-615] made on an alloy (unannealed) closely similar to Inconel gave the curves of Fig. 9.

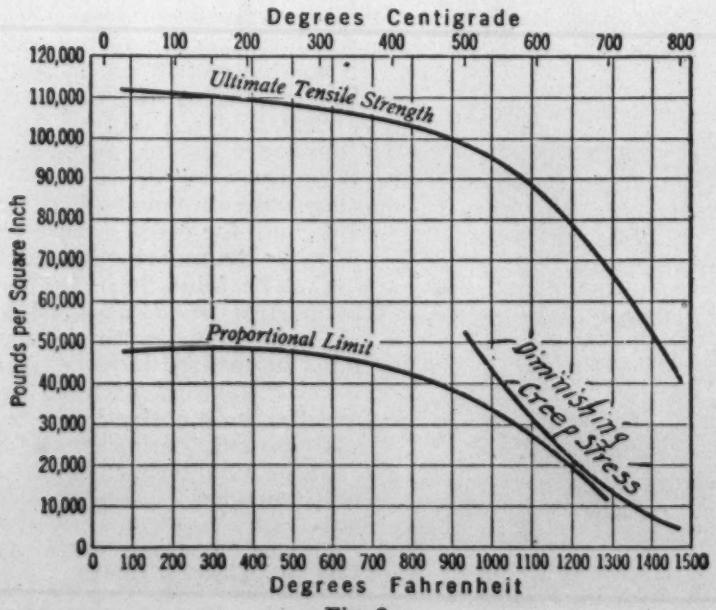


Fig. 9.

The creep tests were made by observing the stretch of a series of specimens held at a single temperature but under different loads. The stresses were so chosen that the higher stresses caused fracture over a period of time, and the lower stress would not cause determinable creeping at the end of a 50-day period. From these results the authors estimated the stress at a given temperature which would not cause continuous creep. The curve given shows this value as it varies with temperature. Certainly the results are useful as indications, if not as accurately established values.

Impact Toughness

Impact tests made on Inconel specimens using the Charpy test ing machine, gave results averaging 200 ft.-lbs. Even with energy absorption of this high order the specimens failed to fracture. These results indicate a toughness that ranges considerably higher than the steels and higher than other nonferrous alloys.

TABLE VIII. Erickson Ductility

	Depth of cup at fracture—in.	Bean load at fracture lbs.
7/8" ball and 1" vertical side mandrel	.470	13,500
7/8" ball and 1 5/8" tapered side mandrel	.550-.600	

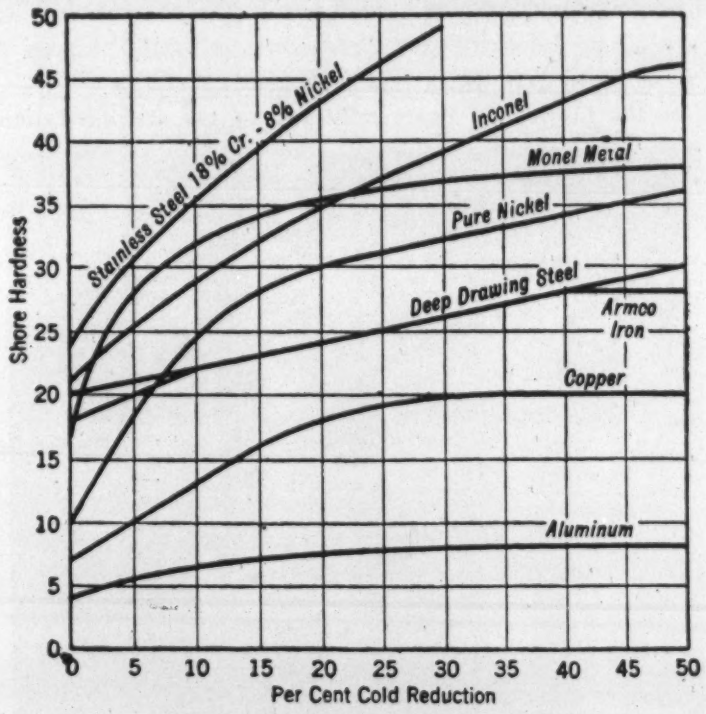
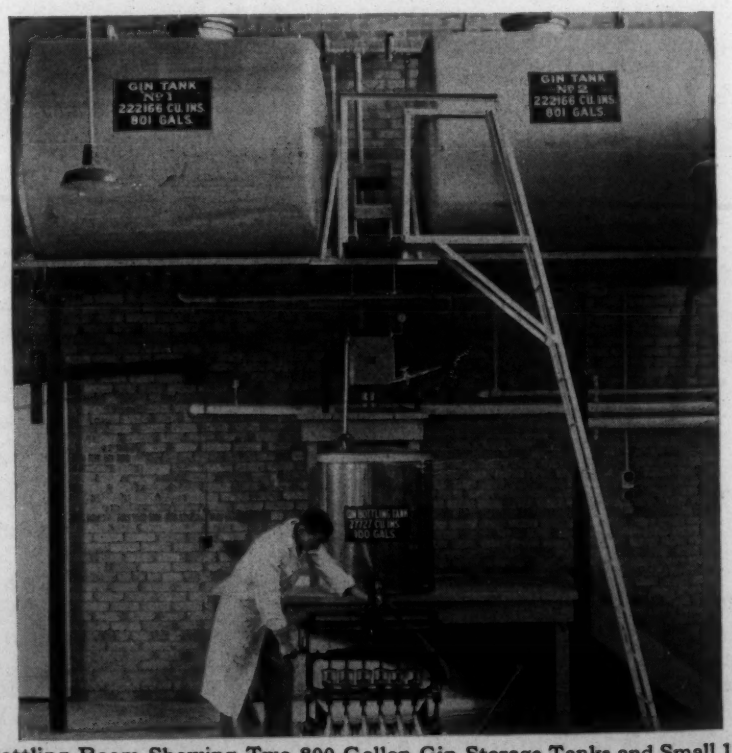


Fig. 10. Hardening with Cold Rolling

The combination of high physical properties, wide corrosion resistance, ease and variety of fabrication methods, and freedom from intercrystalline deterioration by heat or corrosion it is believed make the availability of this metal in the usual shapes a useful advance in engineering.



Bottling Room Showing Two 800 Gallon Gin Storage Tanks and Small 100 Gallon Bottling Tank. Storage Tanks are Inconel, Bottling Tank is Nickel.

CURRENT

METALLURGICAL ABSTRACTS

A digest of the important metallurgical developments of the world

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Note:—The markings between the columns of abstracts will be there each month from now on. When the next index is made the references will be to tenths of pages, right or left, and the rule will simplify finding the material desired.

CLASSIFICATIONS

GENERAL (0)
PROPERTIES OF METALS (1)
PROPERTIES OF NON FERROUS ALLOYS (2)
PROPERTIES OF FERROUS ALLOYS (3)
CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)
STRUCTURE OF METALS & ALLOYS (5)
- Metallography & Macrography (5a)
- Structure & X-Ray Analysis (5b)

PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)
- Fatigue of Metals and Alloys (6f)

ELECTRO-CHEMISTRY (7)
- Electroplating (7a)
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METALLIC COATINGS OTHER THAN ELECTROPLATING (8)
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- Crushing (33e)

The readers of METALS & ALLOYS will be interested to know that 5234 abstracts appeared in Current Metallurgical Abstracts in Vol. III of METALS & ALLOYS. As mentioned above the service now covers over 700 publications. An effort is made to have each abstract present the data appearing in the original article. The length of the abstract permits presenting all essential information, as the average number of words per abstract is 160 words. For most purposes the reading of the abstract can substitute for reading the article.

PROPERTIES OF METALS (1)

Magnesium. J. A. Gann. *Metal Progress,* Vol. 21, Apr. 1932, pages 33-38, 48.

The author traces the development of the use of Mg and its preparation during the last 20 years in which time the price has been reduced from $5.00 to $0.30 per pound. The present process of manufacture consists of electrolysis of Mg Cl_2 dehydrated in an atmosphere of HCl gas. The metal so produced has the following analysis, Al 0.022%, Fe 0.034%, Si 0.012% and Mg 99.93%. A table gives the properties of various Mg alloys. WLC (1)

Mechanical Properties of Nickel Wires. C. E. Ransley & C. J. Smithells. *Institute of Metals, Advance Copy* No. 615, Sept. 1932, 12 pages.

High-purity Ni was prepared by redepositing electrolytic Ni in a chloride bath and melting in H. Wires were prepared from commercial Ni (99.39%), refined Ni (99.91%), Ni plus 0.34% Mn, Ni plus 0.07% Mg, and Ni plus 2.33% Fe. Most of the wires tested were 0.0423" in diameter. Softening tests were made by tensile tests of samples annealed at temperatures up to 1000° C. Recrystallization temperatures of wires reduced 75% by cold drawing were 480° C. for refined Ni, 580° C. for the Fe alloy, 620° C. for the Mn alloy, 640° C. for the Mg alloy, and 640° C. for the commercial Ni. High annealing temperatures resulted in low elongation values in some wires due to the formation of grains occupying the entire cross section of the wire. Creep tests in which the time to fracture with a given load at temperatures between 600° and 1000° C. were made. The curves obtained were similar to those obtained by other creep-test methods. JLG (1)

Oxidation-Reduction Potentials. LV. The Determination from Equilibrium Data. B. Ferric-Ferrous Electrode. Stephen Popoff, Vernon B. Fleharty & Edwin L. Hanson. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1643-1651.

The oxidation-reduction potential of the ferric-ferrous electrode has been calculated from the equilibrium constant and found to be —0.7473v. This value based on a chemical study is in agreement with —0.7477v. as found previously by the same authors using the e. m. f. method. MEH (1)

The Photoelectric Properties of Silver. Ralph P. Winch. *Physical Review,* Vol. 37, May 1931, pages 1269-1275.

Ag was carefully outgassed and its photoelectric properties were studied during outgassing and after stable conditions were reached. An outgassing curve is plotted for 1200 hours of heat treatment before final readings were taken. For thoroughly outgassed Ag curves are plotted showing photoemission as a function of temperature for fixed wave lengths of incident light. These curves show that for wave lengths near the long-wave limit there is a marked increase in emission with temperature; for wave lengths farther away there is no change with temperature; and for wave lengths still more remote there is a slight decrease in emission with increased temperature. Curves for emission per unit of incident light intensity as a function of wave length show that the long-wave limit at 600° C. is 2700 ± 20 A. U. while at room temperature it is 2610 ± 30 A. U. WAT (1)

The Diamagnetism of Bismuth. S. Ramachandra Rao. *Indian Journal of Physics,* Vol. 7, Part I, Apr. 1, 1932, pages 35-42.

Colloidal Bi when melted and recrystallized shows an increase of diamagnetic susceptibility. This result confirms the observation that the susceptibility decreases with decreasing particle size. Attention is drawn to the work of Goetz (*Proceedings National Academy of Science,* Vol. 16, 1930, page 99; *Physical Review,* Vol. 38, 1931, page 2075) who found that a microscopic structure is superposed on the lattice structure of Bi crystals. There probably exists a relation between this mosaic and the variation of the diamagnetic susceptibility with particle size. 18 references. GN (1)

The Nuclear Moment of Se^{80}. (Das Kernmoment von Se^{80}.) K. Wurm. *Die Naturwissenschaften,* Vol. 20, Jan. 1, 1932, page 85.

The Se-band spectrum in the blue range of the visible spectrum and in the adjacent ultra-violet range has been taken with a large prism spectrograph for the following wave range: λ = 4000 — 4200. Based on his measurements the writer concludes that Se^{80} has no nuclear moment. EF (1)

Magnetic Materials in the Year 1931. T. D. Yensen. *Engineering,* Vol. 133, Feb. 19, 1932, page 235.

Abstract of paper read before the American Iron and Steel Institute, New York, October 23, 1931. See *Metals & Alloys,* Vol. 3, May, 1932, page MA 115. LFM (1)

Corrosion Proof Aluminum. (Korrosionsbeständiges Aluminium.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 1, 1932, page 239.

The properties of a new highly corrosion resistant Al alloy which has recently been developed in Germany are described. Its applications for many purposes are given. The alloy probably will replace pure Al in many instances. The new alloy is known in Germany under the symbol A W 15. GN (1)

Contributions to the Physical Chemistry of Rhenium. (Beiträge zur physikalischen Chemie des Rheniums.) W. A. Roth & G. Becker. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 159, Mar. 1932, pages 27-39.

The heat of formation of Re_2O_7 at 20°C. and constant pressure amounts to 295.5 ± 2 kcal and the heat of formation of Re_2O5 is 169 kcal. The following value was computed for $KReO_4$: + 262 kcal. Determinations on the solution heats yielded the following data: $KReO_4$: at 16.7°C. = — 13.93 ± 0.03 kcal and at 21.7°C. = — 13.80 ± 0.03 kcal. $KReO_4$ is a very strong acid and the saturation concentration at 18°C. is 0.0329 N. 10 references. EF (1)

Selenium in Canada. *Canadian Mining Journal,* Vol. 53, June 1932, page 249.

Se was first produced in Canada early in 1931. It is generally sold at $1.80-2.00/lb. in the form of an amorphous powder, or as small rods and buttons. WHB (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

Improvements in Non-Ferrous Metals and Alloys for Chemical Engineering Purposes. *Industrial Chemist,* Vol. 7, Nov. 1931, pages 435-437.

12 references. Requirements are (1) suitable mechanical properties, (2) resistance to corrosion and (3) weldability. Interest was shown in a recently developed Cu alloy with an elastic limit of 4 or 5 tons/in.². The overcoming of manufacturing, as well as welding difficulties is making Al bronze more desirable. Everdur and P.M.G. are the most noteworthy of the Cu-Si alloys. A new Ni-clad steel plate offering corrosion-resisting and high strength properties is still in the development stage. The advantages of Ag, Pb and Ta as well as Al and some of its alloys, are discussed. Mechanically incorporating small particles of foreign metals such as Ag, Bi or Fe into the surface of Pb sheet has been found to increase the resistance of Pb to corrosion. Alloys for high temperature service and electrodeposited coatings are also discussed. RAW (2)

Aluminium Alloys and Their Heat Treatment. *Metallurgist,* May 1931, pages 67-69.

Extended abstract of a paper by M. J. Suhr. See "Thermal Treatment is Indispensable for Aluminum and Light Aluminum Alloys," *Metals & Alloys,* Vol. 2, May 1931, page 95. (2)

Aluminium-Silicon Alloys as Piston Materials. *Engineering,* Vol. 133, Feb. 5, 1932, pages 172-173.

Outlines the various properties of Al-Si alloys which make them suitable for pistons. By proper heat treatment the Brinell hardness of Y-alloy can be increased from 80 to 125. The high thermal conductivity, the low density which is the lowest of all commercial Alloys, and the very low coefficient of linear expansion of these high-Si Al alloys are excellent properties for piston materials. LFM (2)

Properties and Composition of Sand-Cast Aluminum Alloys. *Machinery,* Vol. 38, Nov. 1931, page 200A.

Table and brief notes compiled by the High Pressure Tank Car Dept. of General American Tank Car Corp. RHP (2)

Magnesium Alloy Finds Varied Uses in Germany. *Iron Age,* Vol. 128, Nov. 12, 1931, page 1240.

Mg alloys are widely used by German aircraft manufacturers in motors, wings, fuselage and for interor furnishings. The alloy mostly used is the elektron developed in Germany in 1909. Elektron has a specific gravity of 1.8, melting point of 625°-650° C. and electric conductivity of 12-18. Tensile strength ranges from 14,000 to 31,000 lbs./in.² for castings and 35,000 to 60,000 lbs./in.² for rolled material. Brinell hardness is from 45-70. VSP (2)

A New Light Alloy. *Engineer,* Vol. 153, Jan. 15, 1932 page 70.

The new alloy described is called "MG 7" and is made by James Booth and Co., Ltd., of Birmingham, England. The alloy is composed mainly of Al in combination with Mg and Mn. Exact composition is not given. Its principal physical properties are: specific gravity 2.63, annealing temperature 380° C., forging temperature 400-420° C., fatigue range ± 9.5 - ± 10.25 tons/in.², Brinell hardness 90-115, Izod impact value 17 ft.-lb. As the metal cannot be heat treated, changes in strength must be brought about by varying amounts of cold work. It has a very considerable toughness, can be shaped satisfactorily and since it contains no Cu it can be welded. It is resistant to atmospheric and sea-water corrosion and is entirely free from liability to intercrystalline corrosion. See also *Metals & Alloys,* Vol. 2, Oct. 1931, pages 238-239. LFM (2)

Magnesium and Its Alloys. *American Machinist,* Vol. 75, Nov. 19, 1931, pages 795-796; Nov. 26, 1931, page 833.

Briefly summarizes some information on properties, alloy composition, strengths, casting, heat-treating, forging, machining and working, welding and surface treatment and finishing. RHP (2)

Some Attempts at Making Beryllium-Magnesium Alloys. Ronald J. M. Payne & John L. Haughton. *Institute of Metals, Advance Copy* No. 614, Sept. 1932, 2 pages.

Several methods for preparing Be-Mg alloys were tried without success. JLG (2)

Nickel Alloys and their Application (Nickellegierungen und ihre Verwendung.) A. Pauwen. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Apr. 10, 1932, page 49

The paper deals with the properties and the use of Ni case carburizing steels, Ni bronzes, and Ni-Al. GN (2)

Industrial Alloys of Copper. Reginald G. Johnston. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 55-57.

Brief mention is made of Cu rich alloys, their physical properties and exceptional uses. PRK (2)

The New Aluminum Light Alloy "Chlumin." (Die neue Aluminium- Leicht- Legierung "Chlumin.") W. Keil. *Zeitschrift für Instrumentenkunde,* Vol. 52, Aug. 1932, page 377.

Abstract of a paper by I. Iitaka in *Journal Society of Mechanical Engineers* of Japan, Vol. 33, 1930, pages 203-208. The new Al alloy contains Cr and small amounts of Mg and Fe. Density: 2.71. It is used in cast and rolled state. The mechanical properties are similar to duralumin. The corrosion resistance against sea water is claimed to be superior to any other known Al light alloy. Chlumin is more readily machinable than duralumin. GN (2)

Aluminum-silicon-magnesium Casting Alloys. R. S. Archer & L. W. Kempf. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 448-479.

See *Metals & Alloys,* Vol. 1, Dec. 1930, page 898. (2)

The Heat-Treatment of Non-Ferrous Metals. D. Hanson. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 83-85, 108.

The recent improvements in physical properties of non-ferrous alloys, obtained by combinations of cold working, age-hardening, and heat treatment, are discussed. PRK (2)

Ordinary and Special Bronzes. (Les Bronzes Ordinaires et les Bronzes Speciaux.) Leon Guillet. *Cuivre et Laiton,* Vol. 5, May 30, 1932, pages 223-225.

The influence of quenching on the quality of bronzes is discussed; a quenching temperature of about 600°-650° C. gives a maximum of tensile strength and elongation in almost all bronzes with 5 to 20% Sn. Annealing after quenching increases the hardness, but this method seems to be practiced only for musical percussion instruments; the author recommends it also for industrial processes. Ha (2)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)

Recent Developments in Corrosion Prevention of Ferrous Metals. V. V. Kendall & F. N. Speller. *Industrial & Engineering Chemistry,* Vol. 23, July 1931, pages 735-742.

Presented before the Western Metal Congress, San Francisco, Calif., Feb. 1931. 28 references. This is a review of the principal outstanding developments in corrosion work during the past 2 years, and is treated under the following heads: film formation in relation to physical properties, potentials and continuity; atmospheric corrosion; methods of testing corrosion; underwater corrosion; reconditioning of water pipes and water-cooling apparatus; steam boiler problems; soil corrosion; and corrosion in the oil industry. MEH (4)

Some Recent Papers on Corrosion Research. (Einige neuere Beiträge zur Korrosionsforschung.) E. H. Schulz. *Stahl und Eisen,* Vol. 52, June 23, 1932, pages 614-616.

Summary of recent literature on corrosion research. 10 references. DTR (4)

Coöperation in the Fields of Corrosion and Corrosion Protection. (Gemeinschaftsarbeit auf dem Korrosions-und Korrosionschutzgebiet.) *Farben Zeitung,* Vol. 37, Nov. 7, 1931, page 200.

4 leading German Engineering and Chemical Societies held the first corrosion meeting in Berlin. Among the papers presented, 2 are reviewed in the present article: E. Groos, "Causes, Manifestation and Extent of Corrosion and Corrosion Prevention in Ship Building," and W. Krumbhaar, "On Application of Coatings as Corrosion Protection." In the latter the speaker largely refers to American experiences. EF (4)

Safety in the Chemical Industry. J. Davidson Pratt. *Journal Society of Chemical Industry,* Vol. 51, May 13, 1932, pages 420-427.

The subject is divided into the main headings of fire and explosive risks, gassing risks and corrosive risks. Consideration is also given to design and layout of plant. VVK (4)

Products of Corrosion of Steel. Factors Determining Their Composition and Its Influence on Rate of Corrosion in Oxygenated Water. H. O. Forrest, B. E. Roetheli & R. H. Brown. *Industrial & Engineering Chemistry,* Vol. 23, June 1931, pages 650-653.

The corrosion products having a major influence on ultimate corrosion rates are gelatinous ferric hydroxide and granular magnetic oxide of iron; the former, under the conditions in which it is formed, is very resistant to the diffusion of oxygen and the various ions present, while the latter is essentially non-resistant. The influence of pH on the character of the precipitated film is discussed. MEH (4)

The Protection of Iron and Steel From Corrosion. Part I.—The Principles of Protection. Ernest S. Hedges. *Metallurgia,* Vol. 6, July 1932, pages 87-89.

Deals with action of O and behavior of Fe anodes. JLG (4)

Equilibrium in the Iron-Oxygen-Hydrogen System at Temperatures above 1000° C. Walter E. Jominy & Donald W. Murphy. *Industrial & Engineering Chemistry,* Vol. 23, Apr. 1931, pages 384-387.

A method for the determination of the iron-iron oxide-hydrogen-water equilibrium at various temperatures has been developed in which a gaseous mixture of H and water vapor is allowed to flow past a sample of metallic Fe. The ratio of H to water vapor is controlled so that the mixture will be either oxidizing or non-oxidizing to the Fe and at any temperature the true equilibrium ratio will lie between the closest oxidizing and non-oxidizing points. The equilibrium data when plotted show a break in the curves at about 1357° C. which may be taken as the melting point of the ferrous oxide. 16 references. MEH (4)

On the Galvanic and Potentiometric Determination of the Corrosion Process (Über die galvano- und potentiometrische Bestimmung des Korrosionsvorganges.) M. Th. Michailoff. *Korrosion und Metallschutz,* Vol. 8, Apr. 1932, pages 85-89.

Opens with a discussion of the various factors playing a significent role in corrosion and deals at some length with the galvanometric testing methods. Experiments with 3 grades of cast Fe (no analyses given) in 87, 92, and 97% H_2SO_4 at 20°, 60°, 90° and 300° C. were carried out with the object of discovering some relationship which would furnish a corrosion rate criterion. A ground cast Fe rod with a newly prepared surface is immersed into the acid in connection with a Pt-electrode. The e.m.f. rapidly drops as can be seen from the diagrams accompanying the paper. After 30-50 min. a characteristic value is attained which could be reproduced with the same kind of sample. An almost constant e.m.f. value was determined for each acid concentration and at each temperature. Further testing results are compiled in tables which prove that the rate of dissolution at various temperatures and acid concentrations is not proportional to the e.m.f. although the same material was employed. No correlation of the maximum current density to the corrosion degree (average thickness of layer dissolved during one month) could be established at different temperatures and concentrations of the corroding medium. Different testing samples submitted to the same testing conditions also did not yield a relation between the dissolution speed and maximum current density. The writer concludes that the galvanometric principle involved in Tödt's Corrosimeter does not hold true for Fe tested in H_2SO_4 of high concentrations and therefore strongly advises to directly determine the losses in weight instead. EF (4)

The Corrosion Problem. II. Iron. (Zur Korrosionsfrage. II. Eisen.) E. Naumann. *Gas und Wasserfach,* Vol. 75, May 7, 1932, pages 349-351.

Three types of Fe corrosion are discussed: uniform destruction of the surface, local attack, corrosion of cast Fe (sponginess). The corrosion in the interior of water pipes is then discussed. CO_2 and O are of the greatest importance. All other substances contained in water range next in importance as to their significance for causing corrosion. The corrosion of the outside surface of pipes (effect of the soil) is discussed with reference to the substances contained in the soil, the underground water, and stray electric currents. The remedies are considered: suitable composition of the pipe material, surface coating, purification of the water, special measures in the soil. GN (4)

DURIRON
AND
DURIMET
FOR
Corrosion Resistance

DURIRON is a high-silicon iron more universally resistant to acid corrosion than any other commercially available alloy. Duriron is very hard, strongly resistant to abrasion and scouring, and is of the same quality and properties throughout. It is practically unaffected by sulphuric, nitric, acetic and most other commercial acids, at any strength or temperature.

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STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Influence of Dissolved Carbide on the Equilibria of the System Iron-carbon. YAP, CHU-PHAY. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, page 142.
See *Metals & Alloys,* Vol. 2, May 1931, page 97. (5a)

Thermodynamic Study of the Equilibria of the Systems Antimony-bismuth and Antimony-lead. YAP, CHU-PHAY. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 185-207.
Includes discussion. See *Metals & Alloys,* Vol. 2, Oct. 1931, page 210. (5a)

A Thermodynamic Study of the Phasial Equilibria in the System Iron-carbon. YAP, CHU-PHAY. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, page 141.
See *Metals & Alloys,* Vol. 2, May 1931, page 97. (5a)

Magnetic Properties Versus Allotropic Transformations of Iron Alloys. T. D. YENSEN & N. A. ZIEGLER. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 313-324.
Includes discussion. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 58. (5a)

Alloys of the Transition Elements. *Metallurgist,* Feb. 1932, pages 27-29.
Extended abstract of a paper by Westgren. See "Crystal Structure and Atomic Properties of Alloys containing Transition Elements," *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 239. VVK (5a)

Alloys of Aluminum with Iron and Silicon. *Metallurgist,* Feb. 1932, pages 30-32.
Extended abstract of the paper by V. Fuss in *Zeitschrift für Metallkunde,* Aug. 1931, which appeared originally in *Metallbörse.* See *Metals & Alloys,* Vol. 2, Dec. 1931, page 301. VVK (5a)

Dilatometric Study of Chromium-nickel-iron Alloys. VSEVOLOD N. KRIVOBOK & MAXWELL GENSAMER. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 325-346.
Includes discussion. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 302. (5a)

On the Art of Metallography. FRANCIS F. LUCAS. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 11-44.
See *Metals & Alloys,* Vol. 2, Dec. 1931, page 209. (5a)

Iron-Carbon Alloys and the most Significant Structures of Iron. (Eisenkohlenstofflegierungen und die wichtigsten Gefügebestandteile des Eisens.) H. KATZER. *Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, June 10, 1932, pages 66-70.
General discussion of the equilibrium diagram and the structures of the Fe-C system. GN (5a)

Studies upon the Widmanstätten Structure, II.—The Beta Copper-zinc Alloys and the Beta Copper-aluminum Alloys. ROBERT F. MEHL & O. T. MARZKE. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 123-161.
Includes discussion. See *Metals & Alloys,* Vol. 2, June 1931, page 111. (5a)

The Course of the Reaction between Graphite and Oxides and between heavy Metal Carbides and Oxides. (Ueber den Verlauf der Reaktionen Zwischen Graphit und Oxyden sowie zwischen Schwermetallkarbiden und Oxyden.) OSKAR MEYER. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule Aachen,* Vol. 11, 1932, 6 pages.
See *Metals & Alloys,* Vol. 2, May 1931, page 97. Ha (5a)

Macro-Printing. *Metallurgist,* Feb. 1932, pages 24-25.
Critical abstract of article by Hruska in *Heat Treating & Forging,* Nov. 1931, "Practical Application of Electro-Chemistry to Modern Macrography." See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 239. VVK (5a)

Thermodynamic Investigations of the System Iron-Carbon-Oxygen. (Thermodynamische Untersuchungen zum System Eisen-Kohlenstoff-Sauerstoff.) H. DUENWALD & C. WAGNER. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 199, No. 4, 1931, pages 321-346.
The equilibrium of CO_2 (gas)+C (dissolved in γ Fe) = 2 CO (gas) was investigated between 940° and 1070° C. The saturation concentration of C in α-Fe was determined to about 0.008%. The tests show that the solubility of O in α-ferrite and γ-ferrite is smaller than 0.01% at both 800° and 1000° C. The method of measuring the equilibria by means of an electromagnetic balance is described. Ha (5a)

Optical Hints for the Metallographer. L. V. FOSTER. *Heat Treating & Forging,* Vol. 18, Mar. 1932, pages 201-202; Apr. 1932, pages 265-266.
Discusses magnification, curvature of the field, resolving power and use of filters. MS (5a)

A Study of Aluminum-Iron-Chromium Alloys. (Contribution à l'étude des alliages aluminium-fer-chrome.) CH. TAILLANDIER. *Revue de Métallurgie,* Vol. 29, June 1932, pages 315-325; July 1932, pages 348-356.
A comprehensive study of Al-Fe-Cr alloys prepared from commercially pure metals. A series of 9 alloys was investigated containing 0.42%-2.29% Cr, 0.74%-4.18% Fe, 0.12%-0.21% Si. Thermal and metallographic analysis indicated the presence of a ternary eutectic point around 2% Cr and 1% Fe. The second modification of Al above 560° C. was not found and could probably be attributed to the presence of Si. With Fe and Cr content greater than 5%, the solidus-liquidus range prevents the production of a uniform cast alloy. Resistance study established the presence of a ternary solid solution. Only alloys with less than 2-2.5% Fe and Cr appear to be of interest. JDG (5a)

Structural Changes in Annealing of Mild Steel. (Gefügeänderungen beim Glühen von weichem Stahl.) W. BRENSCHEIDT. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, July 1931, pages 127-139.
If commercial Fe is subjected to annealing of longer duration in an atmosphere of oxidizing gases the edges are decarburized and the grains sometimes grow and assume a pillar or column-like appearance, if tensions and C are present. The greatest columns are formed at 3% deformation, at 6% the formation ceases. The conditions of these formations are discussed in detail on the basis of the experiments and the results illustrated. Ha (5a)

The Solubility of Aluminium in Magnesium in the Solid State at Different Temperatures. P. SALDAU & M. ZAMOTORIN. *Institute of Metals, Advance Copy* No. 596, Mar. 1932, 5 pages.
Determined the solid solubility of Al in Mg by microscopic examination of heat-treated specimens. The Mg was 99.68% pure. The solubility was found to be 12.6% at the eutectic temperature of 436° C., 10.9% at 400° C., 6.08 at 300° C. and constant below 300° C. Although the solubility was apparently constant below this latter temperature, this was thought to be somewhat improbable. The particles precipitated at low temperatures may have been too small to be visible in the microstructure, or the time of annealing may have been too short to allow complete precipitation. Results of other investigators are discussed. 3 references. JLG (5a)

The System Gold-Mercury. (Das System Gold-Quecksilber.) I. N. PLAKSIN. *Zeitschrift für Metallkunde,* Vol. 24, Apr. 1932, page 89.
The results of thermal analyses of Au-Hg alloys is expressed in a constitutional diagram. 2 compounds are present, Au_2Hg and $AuHg_2$, both melting with a peritectic reaction, at 402° (420°?) and 310° C. resp. The approximate solubility of Hg in solid Au is 17%; solid Hg shows no solubility for Au; the 2 metals are completely miscible in the liquid state. Besides 2 peritectic points the system shows a eutectic on the Hg side with only a trace of Au; the eutectic temperature is 0.1° below the freezing point of Hg. RFM (5a)

The Transformation of Austenite Below the Critical Range. J. M. ROBERTSON. *Carnegie Scholarship Memoirs, Iron & Steel Institute,* Vol. 20, 1931, pages 1-64.
44 references. The author gives a theoretical discussion of prior work on the decomposition of austenite touching upon the different definitions of martensite held by various investigators. The tetragonal structure of martensite between the α and γ lattice structures is discussed. A series of 8 steels from 0.10% to 1.73% C have been examined after various quenches with varying rates of cooling from which the mechanism of the various changes is developed. It is shown that for a given C content there is a definite temperature at which martensite begins to form on cooling. Martensite forms while austenite is being cooled; it is practically stable at constant temperature. WLC (5a)

The System Iron-Cobalt-Molybdenum. (Das System Eisen-Kobalt-Molybdän.) WERNER KÖSTER & WILLI TONN. *Archiv für das Eisenhüttenwesen,* Vol. 5, June 1932, pages 627-630.
Report of Research Institute of Vereinigte Stahlwerke, A.-G., Dortmund. In amounts of Mo equal to those represented by the section Fe_3Mo_2-CoMo, the 3-phase system Fe-Co-Mo was investigated from a thermal, dilatometric microscopic basis. Up to the equilibrium concentration the data shows fairly good agreement with the phase diagram of the Fe-Co-W alloys. The 2 compounds Fe_3Mo_2 and Co-Mo form a continuous series of δ- Solid Solutions, duplicating those formed with W. The ternary α- and γ- Solid Solutions precipitate out, and a ternary eutectic could not be found. The eutectic equilibrium of the border systems Fe-Mo and Co-Mo as well as the peritectic equilibrium in the phase system Fe-Co were all lowered by addition of the third element and at 1300° C. establish a 4-phase equilibrium: melt + α-solid solution $\rightleftarrows$ γ-solid solution + δ-solid solution. From this proceeds two 3-phase equilibriums, of which one results in a decomposition: melt = γ-solid solution = CoMo; while the other: α-solid solution = γ-solid solution + δ-solid solution, determines predominantly the transformations in the solid state. The range of concentration in which the α- γ- conversion occurs, was determined closely. Studies on precipitation or separation hardness show that the annealing temperature, at which the maximum hardening is produced, varies with the structural components of the alloy. In the partial system, CoMo-Fe_3Mo_2 still more solid solution of FeMo and Fe_3Mo_2 or CoMo were observed, and accordingly, they indicate the approximate course of the equilibrium curve. DTR (5a)

Application of the Binary and Ternary Diagrams in the Study of the Influence of Sulphur on Steels and Cast-Irons. (Applications des Diagrammes Binaires et Ternaires à l'Etude de l'Influence du Soufre sur les Aciers et les Fontes.) JEAN R. MARECHAL. *Revue Universelle des Mines,* Series 8, Vol. 7, Apr. 15, 1932, pages 389-397; May 1, 1932, pages 417-423.
The following systems were investigated and earlier literature on this subject reviewed: Fe-S, Mn-S, Fe-Mn-S, Fe-S-C, FeS-FeO, Fe-FeS-Fe_3O_4, MnS-Mn-O and FeS-FeO-MnS-MnO. S is always present in the form FeS; its solubility at low temperatures is insignificant both in Fe and in Fe_3C. FeS is found in most cases in the eutectic which is formed at the ternary eutectic point. With low C content, S exists in a binary eutectic and consists mainly of FeS. The solubility of S in austenite at low temperature is so weak that with decreasing temperature FeS is precipitated when the percentage of S exceeds 0.015%. With high C content, S is present as ternary eutectic. The eutectic Fe_3O_4-FeS is found in the diagram near FeS and contains only 0.25-0.5% FeO. The solubility of Fe_3O_4 in S is very weak even at temperatures of 1400°-1500° C. which is very likely the reason that in industrial analyses of samples magnetite has seldom been found. At very high temperatures, FeS and Fe_3O_4 form 2 liquid phases with a fairly weak solubility of Fe_3O_4 in the S and also in FeS in Fe_3O_4. The influence of admixtures of Si, P, Al, Ni, Cu, Zr, Ce and Ti on the other systems is briefly reviewed from literature and diagrams and micrographs reproduced. 32 references. Ha (5a)

Variations in Microstructure Inherent in Process of Manufacturing Extruded and Forged Brass. OGDEN B. MALIN. *Pennsylvania State College, Mineral Industries Experiment Station Technical Paper* No. 1, 1932, 9 pages.
See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 240. AHE (5a)

Equilibrium Relations in Aluminum-magnesium Silicide Alloys of High Purity. E. H. DIX, JR., F. KELLER & R. W. GRAHAM. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 404-420.
Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 904. (5a)

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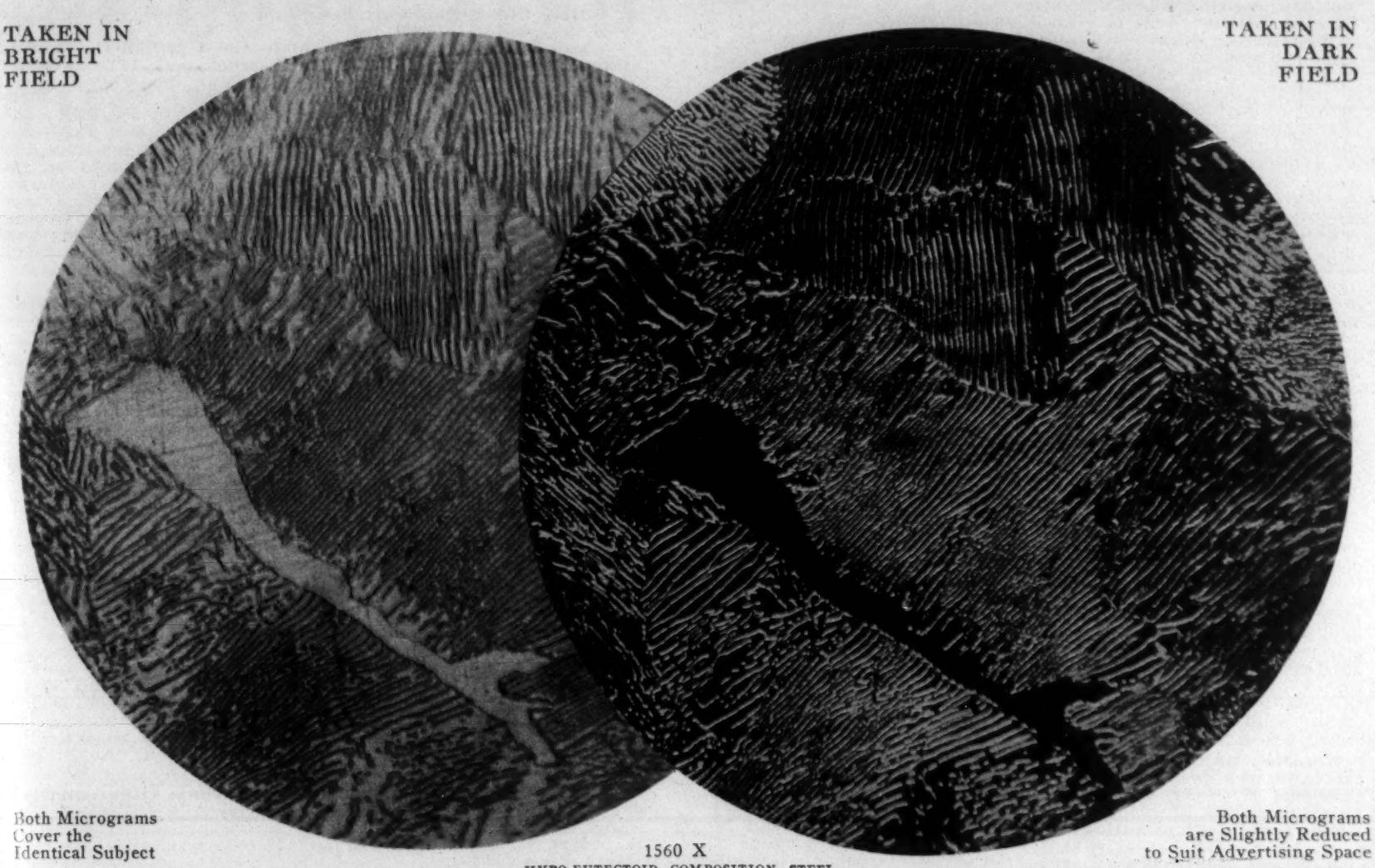

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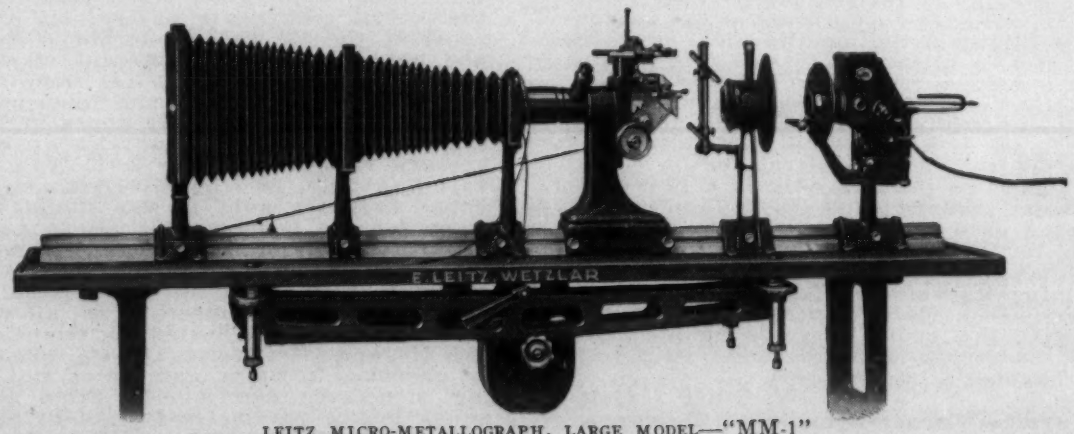

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Equilibrium Relations in Aluminum-antimony Alloys of High Purity. E. H. Dix, Jr., F. Keller & L. A. Willey. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 396-403.

Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 904. (5a)

Equilibria in the Iron-Nitrogen System. Stephen Brunauer, M. E. Jefferson, P. H. Emmett & S. B. Hendricks. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1778-1786.

Equilibrium data are given for the Fe-Fe_4N system at 400° and 575° C. MEH (5a)

The Silver-Gold Alloys as a Type of Continuous Solid Solution (Les Alliages or-argent comme type de solutions solides continues). W. Broniewski & K. Wesolowski. *Comptes Rendus,* Vol. 194, June 6, 1932, pages 2047-2049.

The authors have studied 15 parameters of the alloys of this system as a function of their composition. The alloys were melted in vacuo in a high-frequency furnace. In order to obtain sufficient homogeneity in the samples the ingots were submitted to annealing at 800° C. for 50 hours. They were then drawn into wire 5 mm. in diameter, these wires being annealed finally for 1 hr. at 550° C. for the purpose of removing all the effects of cold work. Measurements of the 15 parameters were made and the results reproduced in a series of diagrams. The authors point out that the diagrams can be divided into 2 groups of curves: (1) those in which the curves rise and fall uniformly (without maximum or minimum) and (2) those in which the curves show a flat maximum or minimum. In the first group can be classed the melting point, e.m.f. of solution, the coefficient of dilatation, and the temperature coefficient of dilatation. All the other curves—electrical conductivity, temperature coefficient of electrical conductivity, thermo-electric power and its temperature coefficient, percentage elongation, hardness, tensile strength, elastic limit—belong in the other group. The characteristics of the curves in the second category are typical, then, of solid solutions; those of the others, with the exception of the fusibility curve, do not allow of solid solutions being distinguished from mixtures. OWE (5a)

The $\gamma-\eta$-Martensite as Widmannstätten Structure. (Der $\gamma-\eta$-Martensit als Widmannstättensches Gefüge.) Heinrich Hanemann. *Archiv für das Eisenhüttenwesen,* Vol. 5, June 1932, pages 625-626.

Report of Metallographic Institute der Technischen Hochschule, Berlin. By a study of two γ- η- martensite polished sections, in planes running perpendicular to each other in the same crystal, it was established that the η- needles lie on correlated octahedral and cubic surfaces or planes. For this reason it is possible to designate the η- γ- martensite crystal structure as a representative "Widmannstätten" structure according to N. T. Belaiew's metal crystallization outline. The 7 directions to be expected were all to be found in the identical crystal section. The deviations from the ideal directions or bearings are less than in the case of the Widmannstätten structure of ferrite, the cubic plane spurs being more abundant. DTR (5a)

Metallographic Examination of Electric Arc Welds. (Metallographische Untersuchung von Lichtbogenschweissungen.) H. Hanemann & A. Hilpert. *Elektroschweissung,* Vol. 3, June 1932, pages 101-108.

The results of metallographic examinations of V- and X-welds made on 6 steel plates (C: .06-.50%) with 3 types of non-coated electrodes are reported. The microscopic examination particularly studied the effect of heat on grain size, formation of pores and structural uniformity of the joint. Mechanical tests were also performed. In the average the joint of all of the samples shows the same tensile strength as the base plate. The notch toughness, however, of all samples is considerably decreased and amounts to not more than 10% of that of the non-welded plate. GN (5a)

Metallography and Macrography. (Précis de metallographie microscopique et de macrographie.) Leon Guillet & Albert Portevin. Dunod, Paris, 1932. Paper 6½ x 10 inches. Price 128 Fr.

This is a standard text book of high value, which first appeared in 1914 and was translated into English by Tavener in 1921. Of course the fundamental principles and facts needed by students do not change much, so that it is perhaps not necessary that the book be revised much to serve its purpose. Yet it is certainly not as good a book as the authors could write today in the light of the metallurgical advances of the last 18 years. It is a misnomer to call this a third "edition," for it is primarily a reprinting with very minor changes and the addition of a few appendices which are largely rehashes of papers published elsewhere by Portevin. Even in the appendix, a paper published in 1920 is referred to as very recent. Aside from some generalities on corrosion, the main thing added in the appendix is a few equilibrium diagrams showing gamma loops. There is no alphabetical index. The paper used is not adequate to show up the micrographs well.

It is disappointing that these able authors did not really revise the book, retaining its valuable features, but incorporating recent advances in metallurgical knowledge in their logical positions in the book. There is no incentive for English-speaking readers to get the "new" edition if they already possess Tavener's translation.

H. W. Gillett (5a)-B-

Examination of the System Copper-Beryllium. (Untersuchung über das System Kupfer-Beryllium.) Heinz Borchers. *Metallwirtschaft,* Vol. 11, June 3, 1932, pages 317-321; June 10, 1932, pages 329-330.

The work of other investigators, given in 8 references, is discussed and irregularities are pointed out. It was found that Cu-Be alloys slightly attacked SiO_2 and C crucibles, so the tests were made in pure MgO crucibles, sometimes with a protective layer of BeO in an atmosphere of H_2. The constitutional diagram of Cu-Be was investigated up to 33% by weight of Be by thermal analysis, microscopic examination, dilatometry and electrical resistance measurements. CEM (5a)

Structure & X-Ray Analysis (5b)

X-Ray Crystal Analysis in Industrial Problems. *Engineering,* Vol. 133, Jan. 8, 1932, pages 29-30.

Brief summary of a report of a committee of the Department of Scientific and Industrial Research entitled "The Application of X-Ray Crystal Analysis to Industrial Problems." Examples are given of the type of work being done and the results obtained. X-ray photographs are reproduced. LFM (5b)

X-Rays for the Detection of Faulty Welds. *Welder,* Vol. 3, June 1932, pages 26-29.

Brief description of an X-ray apparatus and its application in the Babcock & Wilcox Works. Ha (5b)

X-Ray Diffraction Patterns. *Welding Engineer,* Vol. 17, Apr. 1932, pages 35-37.

A number of photographs explain the 3 principal types of diffraction patterns of metallic structures: (1) Patterns showing preferred orientation, indicating directional properties which will persist until the metal is heated sufficiently to normalize it. (2) Patterns showing a strained condition due to the banding of the crystals. Such a condition is characteristic of cast metal and can be considered as due to the amount of heat used, which naturally would be affected by the various rates of cooling. (3) Patterns showing random orientation of the crystals, indicating a state of equilibrium and consequently a more plastic or ductile material. Patterns produced in investigations of welds and welded structures usually belong to the second and third class showing strained conditions and the equilibrium condition. Welds which have been worked show preferred orientation because of the directional properties imparted by the working. The method of taking these patterns is described. Ha (5b)

Poly-Antimonides, Poly-Bismuthides and Their Transition into Alloys. III Communication on Metals and Alloys. (Polyantimonide, Polywismutide und ihr Übergang in Legierungen. 3 Mitteilung Über Metalle und Legierungen.) E. Zintl & W. Dullenkopf. *Zeitschrift für physikalische Chemie,* Abt. B, Vol. 16, Mar. 1932, pages 183-194.

Reports on a new set of experiments in Zintl's program of determining, when the complex structure of solid Na-compounds is going to change into the alloy structure with atomic space lattices, by alloying Na with S, Se, Te, As, Sb, Bi, Sn and Pb. The chemical preparations of the various compounds are given and special attention is called to the alloy Na-Bi. The powder photograms disclose a regular body-centered arrangement of atoms, of which 2 go into the unit cell. The density is $\delta = 6.63$. The various possible arrangements of the Na and Bi atoms are listed. No clues are furnished by powder photograms with reference to Na-Sb. Experiments with the Weissenberg-Bohm Röntgen-goniometer showed that Na-Sb crystallizes in the monoclinic system and that there are 8 atoms of Na and Sb to the unit cell. Higher poly-antimonides and poly-bismuthides decompose to Na-Sb and Sb and Na-Bi and Bi respectively. The X-ray investigations confirm the thermo-analytically determined constitutional diagrams Na-Sb and Na-Bi between 0 and 50 atomic % Na. EF (5b)

X-Ray Study of the System Gold-Platinum (Röntenuntersuchen im System Gold Platin.) W. Stenzel & J. Weerts. Festschrift zum Fünfzigjährigen Bestehen der Platinschmelze (1881-1931). G. Siebert, G. m. b. H. Publisher, G. M. Alberti's Hofbuchhandlung, Hanau. Pages 300-308.

Previous researches on this and related systems are briefly reviewed. The Au-Pt alloys were made from chemically pure metals by melting in magnesia crucibles in a Tamman furnace and then rolling. It was necessary to anneal certain alloys at a high temperature to complete the rolling. Specimens containing 50 to 60% Pt could be rolled cold after annealing several hours at 800°C. A specimen containing 75% Pt was brittle after this treatment: even after remelting, solidifying in the crucible, annealing 1 hr. at 1200°C., and quenching the alloy could not be rolled. In the study of the lattice constant of homogeneous alloys specimens .4 mm. thick and 2 cm. square containing approximately 10, 25, 40, 50, 65 and 90% Pt were quenched after annealing 1 hr. at 1020, 1020, 1160, 1190, 1275, and 1100°C. respectively. Cu radiations were used, and values were corrected to 20°C. by using theoretical coefficients of thermal expansion. The lattice constant for Pt was redetermined using specimens which had been treated in 5 different ways: (1) annealed 1 hr. in high vacuum at 930°C.; (2) same at 1200°C.; (3) heated 1 hr. at 1020°C. in air and quenched in water; (4) annealed 1 hr. in argon; (5) annealed 1 hr. in high vacuum, cooled, and then annealed 1 hr. at 1000°C. in argon. The average value found was 3.915 A.U., and there was little variation due to the different treatments. Using the value 4.070 for gold it was found that the lattice constant for the homogeneous alloys varied practically as a linear function of the atomic % concentration, the maximum deviation found being .002 A.U. As a means of studying the extent of the mutual solubility of these metals at lower temperatures, alloys containing 40, 50, and 60% Pt were heated to temperatures of 1108, 1065, 985, 875, and 675°C. for 1, 1½, 4½, 40, and 170 hrs. respectively, quenched in water, and the crystal lattices of the resulting structures determined. From the previously determined lattice parameter for Au-Pt alloys, the Au and Pt contents of the Au-rich and Pt-rich phases in the duplex structures were calculated, a change of .001 A.U. in parameter corresponding to a change of about .65 atomic %. The maximum temperature of the field of limited solubility was found at about 1180°C. and at about 60% of Pt. At 1100, 900, and 700°C. the solubility of Pt in Au was found to be 43, 30, and 25 atomic % respectively, while the corresponding solubilities for Au in Pt were 19, 7, and 3½ atomic %. The results found by this method of investigation agreed well with those previously reported by Johansson and Linde. The solubilities below 675°C. were not investigated. OEH (5b)

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PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

Modern Theoretical Foundations of Materials-Testing of Metals. (Die heutige theoretische Grundlage der Materialprüfung der Metalle.) W. ENGEL. *Danmarks Naturvidenskabelige Samfund,* Copenhagen, 1931. Paper, 6¾ x 9¾ inches, 67 pages. Price 3 Kr. In German.

A brief discussion of crystal structure and slip in single crystals and polycrystalline material in their bearing on testing; of the influence of test bar shape, speed of testing, etc. Creep fatigue, "Trennfestigkeit," etc. are mentioned as well as tensile and impact tests. The problem of yield strength is quite fully discussed. A useful feature is an explanation of what the German and the Danish terms relating to mechanical testing really refer to. H. W. Gillett (6) -B-

Portable Weld-Testing Machine. A. EYLES. *Mechanical World & Engineering Record,* Vol. 89, Mar. 27, 1931, page 295.

The new Southwark-built Oxweld portable testing machine is an accurate, reliable, inexpensive machine for routine testing or for small laboratories and welding shops, where the investment in a large universal machine would be unwarranted. The machine, which is illustrated and described, weighs 165 lb., measuring 28" in overall length and 6¾" in diameter. The load is applied by means of a small hand pump, operating a piston, carrying one set of grips, the other set being held in a holder rigidly attached to the machine. The stress is measured directly in lb./in.^{2} (standard size specimens by suitable calibrated pressure gage. WHB (6)

Magnetizability of Mixed Substances. (Ueber die Magnetisierbarkeit von Mischkörpern.) E. GEROLD. *Archiv für Elektrotechnik,* Vol. 26, Mar. 22, 1932, pages 168-176.

A revised measurement of alloyed substances in which a ferromagnetic material is embedded in very fine distribution in a non-magnetic material led to the conclusion that the magnetized particles do not act on one another as long as the ratio of the average distance of their centers to their average diameter is larger than about 1.6 to 2. For mixed substances where this ratio $<$ 1.6 the specific magnetization per g. of the ferro-magnetic constituent increases with the decrease of the ratio if the shape of the sample and the shape of the ferro-magnetic constituent are different; if both have the same shape this effcet disappears and for the saturated state the shape has no influence on the magnetization for all ratios of mixture. The magnetization curves permit conclusions with regard to the ratio of length to diameter of the ferro-magnetic particles. Ha (6)

The Hardness of a Steel Tube Along Certain "Lüders" or "Piobert" Lines. HENRY FOWLER. *Engineering,* Vol. 132, Sept. 4, 1931, page 299.

Contribution to the Report of the Committee on Stresses in Overstrained Materials presented to Section G of the British Association for Advancement of Science, Sept. 1931. LFM (6)

Indentation Hardness of Test Pieces Resulting from Plastic Flow. HENRY FOWLER. *Engineering,* Vol. 132, Sept. 25, 1931, pages 420-421.

Contribution to the Report of the Committee on Stresses in Overstrained Material presented to Section G of the British Association for Advancement of Science, Sept. 1931. LFM (6)

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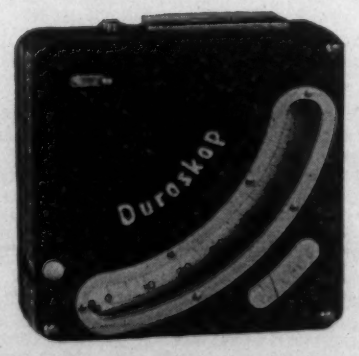

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INDUSTRIAL USES & APPLICATIONS (9)

Investigating Machinery Performance and Design. LOUIS JORDAN. *Commercial Standards Monthly*, Vol. 8, Apr. 1932, page 301.

The design and performance of machinery reflects promptly and in great detail current advances in knowledge of the fabrication and treatment of metals. All research in physical metallurgy is, either immediately or ultimately, of interest to the builders and users of all types of machines. Among the active research projects of the Division of Metallurgy at the Bureau of Standards several of the problems are of rather immediate interest in this survey of machinery. The various metallurgical research problems under consideration are briefly enumerated. Among these are investigations on the wear and machinability of metals; the properties of metals at high and low temperatures; the changes in volume of metals during casting; the fluidity of metals during casting; methods of controlling the conditions of foundry sands; the corrosion of metals; the failure of metals by fatigue, popularly but erroneously described as failure by crystallization. WAT (9)

The Rail Question. (Zur Schienenfrage.) A. HASCH. *Stahlbautechnik*, Supplement to *Montanistische Rundschau*, Vol. 24, Mar. 16, 1932, pages 5-7.

The article deals with the testing of rails by the Vienna Street Railway System. The successful practical application of rails depends on the elimination of failures due to frosty weather, a high resistance to wear and good weldability. GN (9)

The Value of Chromium Plated Screws in the Chemical Industry. (Über den Wert verchromter Schrauben in der chemischen Industry.) CARL HÜTTER. *Die Chemische Fabrik*, Feb. 24, 1932, pages 59-60.

The use of Cr plated screws and nuts in HNO_3 manufacturing plants has prolonged the life of the screws, reduced repair costs and eliminated shutdowns. Cr is plated direct on steel at low current density, without preliminary Ni plating. Cr deposited in this way is comparatively soft but free from porosity. The screws are tested by boiling in HNO_3 for 2 to 3 weeks and should show no loss in weight during this test. CEM (9)

The Application of Nitrided Steel Parts in General Engineering. J. E. HUNT. *Iron & Steel Industry & British Foundryman*, Vol. 5, Mar. 1932, pages 235-239.

A brief discussion of the nitriding process. The application of nitrided steels for valve parts, cams and gears, machine tool and textile machinery parts, and wear and fatigue resistant parts are described. CHL (9)

Metallic Construction of Airplanes (La Construction Métallique des Avions). G. R. HAMEL. *Aciers Spéciaux, Métaux et Alliages*, Vol. 7, Mar. 1932, pages 93-98.

Mechanical features of airplane construction are generally discussed. GTM (9)

An Electrically Welded Airplane Hanger in Brazil (Eine elektrisch geschweisste Flugzeughalle in Brasilien.) H. HINDEN. *Elektroschweissung*, Vol. 3, Apr. 1932, page 79.

Short description of an airplane hangar recently built at Rio de Janeiro, Brazil. The hangar has a span width of 34 m. and is completely welded. GN (9)

Service Pipe Practices. H. A. HARRIS. *Water Works Engineering*, Vol. 85, Apr. 20, 1932, pages 430-432.

Standardized methods employed by a large water company in making service installations with Cu and cast iron pipe. Studies were based upon a great many soil and water conditions. CBJ (9)

Some Notes on Steel Shipbuilding. N. M. HUNTER. *Advance Paper, Institution Engineers & Shipbuilders*, Newcastle-on-Tyne, Mar. 1932, 15 pages.

Although the various parts of a ship's structure and also the methods of fabricating and putting them together have been standardized to a great extent there remain still some special jobs where this is not possible and which the author discusses and illustrates by a great number of drawings. Electric welding is applied very extensively as it combines strength with lightness, eliminates all danger of leakage and the necessity of caulking. This latter especially is a source of weakening the riveted structure. Ha (9)

Metallurgy and the Motor Car Industry. ROBERT HADFIELD. *Heat Treating & Forging*, Vol. 18, Jan. 1932, pages 24-27; Feb. 1932, pages 102-103.

Progress in the automobile industry has been made possible largely by the discoveries and products of the metallurgist, particularly in the field of alloy steels. Performance of the modern car is due to the fact that the working parts which are subject to severe stresses and vibration are made from modern special steels. Their use is more economical than ordinary steel, notwithstanding their higher cost per lb., as a great reduction in weight is obtained, as well as improved physical properties. Knowledge gained from the development and use of these materials has favorably influenced the manufacture and treatment of C steels. Heat-resisting and stainless steels are finding important applications. The former are used in the valves of internal-combustion engines and the rotors of exhaust-gas turbines and improve engine efficiency. Author's firm in collaboration with several others, has developed a Ni-Cr steel having a tensile strength of 21.5 tons/in.^{2} at 800° C. Si-Mn steel is superior for springs. The rolled eye is to be favored for the master leaf of springs. A combination of various methods of testing is necessary to arrive at an idea of the quality of a material. Best results can be obtained only by paying the most careful attention to all stages in the manufacture of steel. Gives results of some comparative tests on Ni-Cr steels containing different total amounts of S and P. For example, a Ni-Cr steel with 0.64% C and 0.08% S+P, and having a Brinell hardness of 600, withstood 60,000 blows in a repeated impact testing-machine. A similar specimen containing only 0.027% S+P with the same hardness, withstood 167,000 blows before fracture. In the Stanton repeated impact testing-machine, the first steel withstood 52 blows, while the second withstood over 160 blows. One outstanding lesson of recent metallurgical progress is the importance of continual research. MS (9)

Research and Practice with Widia Metal Used in Chisels for Cutting Coal. (Versuche und Erfahrungen mit Widia-Schrammeisseln.) J. MENKE. *Glückauf*, Vol. 68, Apr. 9, 1932, pages 337-343.

Widia metal is prepared by mixing pure W and pure C in weight proportion to form tungsten carbide, WC. The mixture is kept at a definite temperature for a time, until WC has formed. The WC is pulverized, 4 to 6% Co is added, and carefully mixed together. The desired shapes are pressed out under extremely high pressures, sintered in an electric furnace at 1400 to 1600° C., with air excluded. The Co fuses and acts as a binder for WC. The product is Widia metal and is ready for use as tool metal in coal cutting machines. Production of Widia metal coal-cutting chisels and bar picks is described. Shaft of the tool is Cr-Ni-Mo Steel with T. S. minimum 150 kg./mm.^{2} Cutting or working end is Widia metal. The latter is brazed to the shaft at 850° C., a thin bronze sheet or strip is placed in between shaft and cutting end, to take care of variations in expansion. Comparisons were made of cost, life, amount of sharpening work for W-Steel, Stellite and Widia metal. After extensive series of practical tests, running over number of months, it was demonstrated that Widia cutting tools give: (1) simplified cutting work with decreased costs; (2) with very hard coal, especially when pyrites and clay bands are present, considerable savings in compressed air and labor is possible; (3) since Widia chisels never become as dull as steel chisels, and since the coal cutting machine is driven carefully, less trouble occurs to the machine, with resulting increased life and decreased use of spare parts; (4) less amount of small coal sizes are produced due to narrower cut. DTR (9)

Metal Baths for Heating, Distilling and Similar Apparatus. (Metallbäder für Koch-Destiller und Ähnliche Apparate.) M. GRELLERT. *Apparatebau*, Vol. 43, Oct. 2, 1931, pages 229-230.

The article refers to a former publication (T. Melz, Metallbad zur Wärmeübertragung für Koch-, Destillier und ähnliche Apparate, *Apparatebau*, Vol. 43, Apr. 2, 1931, pages 76-77) in which a new heating method has been described. The author states from his own experience that the new method is disadvantageous and doomed to failure. GN (9)

Material for Diesel Cylinder Liners. M. E. GREENHOW. *Power*, Vol. 75, Apr. 12, 1932, pages 546-547.

A general review is given of cast Fe composition and properties. AHE (9)

Oxy-Acetylene Welding Applied to Scales. F. C. HASSE. *Scale Journal*, Vol. 18, May 1932, pages 5-6.

The properties of O and C_2H_2 are briefly described and the apparatus and methods for welding explained. The advantages of welding the rails on scales are stated to be: smooth running of cars over scale, impacts to joints are eliminated, angle bars and the necessity for tightening bolts that hold rails and become loose due to impacts at joints are eliminated. Ha (9)

Welding of A Bridge. (Ausführung einer geschweissten Fachwerksbrücke.) L. GERSTENBERG. *Stahlbautechnik, Supplement* to *Montanistische Rundschau*, Vol. 24, Mar. 16, 1932, pages 1-2.

Description of the welding of a bridge in the harbor of Hamburg. GN (9)

Metal Pipe and Flexible Tubing in Auxiliary Ventilation of Metal Mines. OSCAR A. GLAESER & S. H. ASH. *Mining Congress Journal*. Vol. 18, Apr. 1932, pages 24-26.

Auxiliary ventilation of dead ends of drifts in metal mines, and in boring of large and small tunnels, has become an important phase of driving operation. In tunnel driving standardized practice now exists, but in metal mines, little attention has been paid to efficient operation of auxiliary ventilating equipment. Some doubt has existed as to whether metal pipe or flexible tubing should be used and also relative economy. Zn-coated Fe, 22 to 14 gage, is most commonly used as metal tubing or pipe, depending upon size of pipe and mining conditions. 20-gage metal is considered too light for 16" pipe. An example giving comparative cost of a typical installation is shown: Assume that during a 12-month period 15,000 ft. of duct is installed:

	16" flexible tubing		16" pipe	
Item	Total	Per ft., cts.	Total	Per ft., cts.
Labor	$ 711.00	4.74	$ 1,992.00	$ 13.28
Depreciation & Shrinkage, 20%	1,830.00	12.20	645.00	4.30
Material	9,150.00	61.00	12,900.00	86.00
	$11,691.00	77.94	$15,537,00	$103.58

Metal versus Flexible Canvas Tubing

Condition	*Metal*	*Flexible*
Exhaust system	Favorable	Unfavorable
High pressure systems	"	"
Long lines with a number of boosters	"	"
Permanent installation	"	"
Storage, transportation & handling	Unfavorable	Favorable
Installing	"	"
Capacity	Usually better for metal	
Leakage losses	About the same	
Temporary installations	Unfavorable	Favorable
Heavy blasting	Favorable	Unfavorable
Long Life	"	"
Repairs	Unfavorable	Favorable

DTR (9)

Construction of an Overcrossing on Steel Piles. MILO S. FARWELL. *Engineering News-Record*, Vol. 108, Mar. 31, 1932, pages 463-464.

A highway structure 1,380 ft. long was constructed in California. Welded connections were used for the first time on a major highway structure by that state. Complete details are included. CBJ (9)

Heat Insulation with Metal Foil. J. L. Gregg. *Product Engineering,* Vol. 3, May 1932, pages 204-206.

The rather paradox phenomenon of the use of metals as heat insulators can be brought about by 2 methods which are described in detail. In one way flat sheets of foil are held apart by suitable spacers between which the air acts as insulator as it is held stationary and, therefore, can not conduct heat by conduction. In the other way, foil sheets are slightly crumpled and stacked one on top of the other to form irregular air layers with the same effect as before. The foil used has a thickness of 0.00025". Foil covered paper is used to give the metal sufficient mechanical stiffness. The heat insulation compares very favorably with the more generally used heat insulating materials, for instance 0.34 B.t.u. as compared with 0.38 with corrugated paper or 0.32 for cork. Several methods of practical application are explained. Ha (9)

Experiences in Building Nickel Apparatus. (Erfahrungen im Bau von Nickelapparaten.) M. Grellert. *Apparatebau,* Vol. 43, Jan. 9, 1931, pages 1-5.

The article deals with the difficulties which were encountered in building chemical vessels of pure Ni which had to stand a pressure of 50 atmospheres and a temperature of 250° C. The difficulties were in particular caused by the customer's demand that a 98% Ni be used. GN (9)

The Application Possibilities of Aluminum in Modern Structures. (Ueber die Verwendungsfähigkeit des Aluminiums im neuzeitlichen Bauwesen.) W. Elsner von Gronow. *Aluminium,* Vol. 14, Feb. 29, 1932, pages 2-5.

The uses and advantages and economies possible are discussed quite generally with reference to buildings, in particular for roofing and window fixtures where Al and its alloys have found great use. Ha (9)

The Tungsten Lamp. W. E. Forsythe & E. M. Watson. *Journal Franklin Institute,* Vol. 213, June 1932, pages 623-637.

Use of W for incandescent lamp filaments is narrated. Outstanding properties that make W valuable for this special purpose are: (1) favorable radiating characteristics; (2) lower vapor pressure and high melting point; (3) high tensile strength; (4) its ductility. Sufficient supply of this metal exists so that filament costs are not excessive. Originally there was no ductile W wire, and in 1910 Dr. Coolidge discovered a method of making ductile W wire of almost any diameter. This was the most important step in lamp making. W was not chosen as the material for the present day lamp filament by any accident or guess, but it was chosen because it possessed outstanding and suitable metal properties for this purpose. Brief mention is made of Nernst flower, Ta, Os, filamentless lamps. Efficiency of W as a light source as a function of its temperature is given. At 2000° Kelvin, efficiency is roughly 3 lumens/watt and at 3600° Kelvin, 50 lumens/watt. This is a slightly higher efficiency than that of a black body with similar temperature variation. Other characteristics, lamp efficiencies and losses, frosted lamp bulb studies are discussed. DTR (9)

Alloys in Machine Tools. D. M. Gurney. *Heat Treating & Forging,* Vol. 18, Feb. 1932, pages 113-114; Mar. 1932, pages 185-186.

Paper presented before the Conference on Metals and Alloys, Case School of Applied Science, Cleveland. See *Metals & Alloys.* Vol. 3, July 1932, page MA 215. MS (9)

Beryllium and Its Alloys. (Beryllium und seine Legierungen.) H. Fischer & G. Masing. *Die Naturwissenschaften,* Vol. 19, July 3, 1931, pages 590-595.

Discovery, relative distribution on earth, natural occurrence, chemical preparation according to Wöhler, Stock, Goldschmidt, and commercial production methods (Siemens & Halske) are covered in the introduction. The utilization of Be in light metals and alloys proved to be commercially unimportant, whereas fargoing effects were noticed in heavy metals due to Be-additions. The age-hardening prerequisition in regard to the course of the solid solution line was met with in the following binary systems; Cu-Be, Ni-Be, Co-Be and Fe-Be at concentrations between 2-4% Be. The commercial significance of Cu-Be alloys is shown by comparing the strength data of these alloys with bronze. Great fatigue strength and elasticity predict the use of Be-bronze for springs. The Ni-Be alloys are under development, their remarkable strength being emphasized. The addition of Be to Fe with a low content of Ni is discussed. The use of Cu-Be alloys for deoxidizing purposes is urged and the superiority to P, Mg, Ca, Al is claimed. The advantageous utilization of Cu-Be alloys as bearing metals is considered. The paper concludes with the theoretical results of investigations into precipitation hardening in Be-alloys. EF (9)

Beryllium. K. G. Frank. *Scientific American,* Vol. 146, May 1932, pages 270-271.

Metallurgical research and investigation has succeeded in definitely putting Be on the list of metals for commercial use. The improvements obtained by additions of 1-1½% of Be to Cu alloys is briefly described. The commercial production of Be is outlined. The present cost of Be is about $80 per lb. a substantial reduction from $225 per lb. in 1930. WAT (9)

Architectural Metals. I. R. Disbro. *Case School of Applied Science Conference on Metals & Alloys,* Cleveland, Nov. 1931, 17 pages. Mimeographed.

Discussion of artistic architectural effects obtained with various alloys. Solid metals are preferred to plated ones, by the architect. Corrosion is important in choosing a metal for exterior use. Wrought Fe is characterized as prone to rust, needing oiling or waxing. Stainless steel requires care not to put other metals in contact that would set up electrolytic action. Monel is said to be free from this difficulty. Pb, Al bronze and Al are among the metals least affected by outdoor exposure. The green patina on Cu is pleasing, but the black tarnish on brass is not. The use of bronze dates from antiquity, and it is doubtful if any of the newer metals, despite temporary vogues, will ever be able to do more than compete with it where the best in architectural decoration and utility is required. For some exterior uses, bronze should either be lacquered yearly or waxed every month. The contrast between matt and shiny Al makes it especially useful in decoration. Stainless steel is assured of a continued demand. Modern tendencies are toward simplicity rather than ornateness. HWG (9)

Concrete Culverts Lengthened with Corrugated-Iron Pipe. H. A. Pabst. *Engineering News-Record,* Vol. 108, June 16, 1932, page 859.

When highway was widened to meet new standards existing concrete culverts were extended by special corrugated-iron pipe with expansion end. CBJ (9)

All-Welded Factory Extensions at Murex Welding Processes, Ltd. F. O'Connor. *Welder,* Vol. 3, May 1932, pages 7-21.

The design and construction details of a factory building covering 37,000 ft.² having a length of 231 ft. and a span of 160 ft. is described. Ha (9)

The All Metal Monoplane "Breda 32" (Il monoplano interamente metallico "Breda 32") A. Parano. *Alluminio,* Vol. 1, Jan.-Feb. 1932, pages 36-40.

The stress-carrying members and the fuselage and wing coverings of this tri-motored transport plane are duralumin. Motor cowling, window frames, chairs, and many secondary parts are of wrought or cast elektron. No metallurgical details are given. HWG (9)

Aluminum Alloy Conductors, Aldrey. (Conduttori in lega di alluminio, I conduttori in Aldrey). C. Pramaggiore. *Alluminio,* Vol. 1, Mar.-Apr. 1932, pages 80-107.

Electrical conductors of Aldrey, 0.60% Si, 0.45% Mg, 0.25% Fe, which have been given the precipitation hardening or accelerated aging heat-treatment are compared with steel cored, unalloyed Al cables and with Cu conductors. One Aldrey line has been up 7 years, and its corrosion-resistance is considered equal to that of commercial unalloyed Al. The hardness of Aldrey makes it less liable to damage during erection than Al. Its tensile strength is about 47,000-50,000, its yield strength (0.05% set) 42,500 and 38,500 (0.2% set), and its permanent load-carrying ability about 40,000 lbs./in.², with 6 to 7% elongation in 8", 90 to 100 Brinell. Its endurance limit, rotating beam, 20 million cycles, is 14,500 to 17,000 lbs./in.². Conductors of equivalent conductivity are Cu 94, pure Al 153, steel cored Al (30 Al, 7 steel wires) 178, Aldrey 171, mm.². These, carrying the same current, will give the following temperature rise in deg. C., Cu 40°, Al or Al-steel 36°, Aldrey 32°. Proper mounting of conductor cables will avoid failure from repeated stresses. Various methods of mounting on rigid insulators and of anti-vibration mountings of oscillating suspensions, of connecting Cu and Aldrey cables with insulating washers to avoid contact corrosion, and methods of jointing, as by right and left handed turn trickle connections, by twisted sleeves and by sleeves forced on by wire drawing, swaging or compression methods, are illustrated by photographs. The corona effect and loss of energy in transmission, etc. on lines of different materials discussed. Author with firm producing Aldrey. HWG (9)

Steel Plates with Welded Joints Seal Rockfill Dam. H. I. Reid. *Engineering News-Record,* Vol. 108, May 26, 1932, pages 761-763.

An unusual application of welding was made in constructing the steel-plate facing for a rockfill dam for the new water supply for the Broadmoor Hotel, which is about 5 miles from Colorado Springs, Colo. Structural-steel plates 20 ft. long and 8½ ft. wide containing not less than 0.2% Cu were used. All joints and all assembling bolt heads were welded to insure watertightness. CBJ (9)

A New High-Pressure Cast Joint for Gas and Water Transmission Pipes. (Eine neue Hochdruck-Gussrohrverbindung für Gas- und Wasserleitungen.) C. Pardun. *Das Gas- und Wasserfach,* Vol. 75, Jan. 30, 1932, pages 89-91.

Necessity has led to a demand for joints which cannot be damaged and hence cause economic loss and trouble. High-pressure joints in the past have been made of Pb covered with hemp. Today the effects of corrosion and higher pressures require something better. Solders or welds have not proved satisfactory in the United States. The cast Fe in pipes lacks sufficient elasticity, and this causes fractures. Steel tube joints have to be supplied with a muffle or similar equipment with packing gland. Hence to supply both density and strength in length and cross-section, a cast piece is placed over joint. Rubber is used as a packing agent. MAB (9)

Nickel and Nickel Alloys in Marine Engineering. J. McNeil. *Metal Industry,* London, Vol. 39, Dec. 18, 1931, pages 583-585; Dec. 25, 1931, page 609; *Iron & Coal Trades Review,* Vol. 124, Feb. 12, 1932, page 277.

From a paper read before the Institute of Marine Engineers, Dec. 1931. Thick deposits of Ni of BHN 320-350 are used for repair work and for corrosion prevention of expansion sleeves subject to the action of superheated steam. Ni plated cast Fe propellors are being tried out in service tests. Ni-Cu 70:30 alloys find use because of high limiting creep values at high temperatures. Cu-Ni 70:30 alloys are used in water tube boilers. Monel metal finds use for propellor shafts, turbine blading, valve parts in steam lines, etc. Ni bronze is a successful development for propellors of fast multiple-screw ships. Alloys of 65 Ni, 15 Cr and Fe, with special additions to increase sulphur corrosion resistance at high temperatures are used for superheater tube supports, baffle plates of furnace doors, furnace arch supports, etc. Ni in cast Fe is being experimented with. PRK+Ha (9)

Future Fields for Alloy Steels. J. M. Schlendorf. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 31-32.

Alloy steels will find extensive application where strength is important and in the making of stampings. Trend toward the use of alloying elements in small amounts is increasing, particularly for purposes of uniformity, and it is to be expected that much wider use of Si, Cu, Mn, Cr and similar elements will be made in the future. Perhaps the greatest future development of alloy steels lies in their ability to resist atmospheric corrosion. These steels will be of a simpler nature with lower alloy content than the present highly alloyed stainless steels. An equally great field for alloy steels lies in their use as heat-resisting materials. Not only do they resist scale formation, but they possess high strength at elevated temperatures. MS (9)

Hardening a Clock Balance Staff, Development of Present Practice. J. A. Reinhardt. *Metal Progress,* Vol. 21, May 1932, pages 55-60.

Gives the history of metallurgy in the clock factory. Modern heat treating and testing to specifications of balance staffs are described. Extensive tests indicate that plain C steel parts wear longer than Cr and Mo alloy steels. WLC (9)

HEAT TREATMENT (10)

Annealing (10b)

Effect of Gaseous Atmospheres in the Bright Annealing of Metal. R. J. Cowan (Surface Combustion Corp.). *Fuels & Furnaces,* Vol. 9, Nov. 1931, pages 1307-1308.

From a paper read before the American Gas Association and published in *Steel,* Vol. 89, Aug. 13, 1931, pages 34, 36, 38. See *Metals & Alloys,* Vol. 3, May 1932, page MA 131. MS (10b)

Bright Annealing of Metals with Hydrocarbon Gases. E. G. de Coriolis & R. J. Cowan. *Industrial & Engineering Chemistry,* Vol. 24, Jan. 1932, pages 18-20.

See "Use of Hydrocarbon Gases for Bright Annealing of Metals," *Metals & Alloys,* Vol. 3, May 1932, page MA 131. MEH (10b)

The Annealing of Steel Castings. W. R. D. Jones & P. Field Foster. *Proceedings South Wales Institute of Engineers,* Vol. 48, Apr. 7, 1932, pages 43-66.

Annealing medium C steel castings at 875° C. for 1 hr./inch of cross-section is satisfactory. Prolonged exposure to the annealing temperature is not an advantage but no serious damage is done to the static properties. Tensile tests are not affected seriously by inclusions present, but they have a very pronounced effect on resistance to fatigue. Annealing at 875° C. lowers the fatigue-resisting properties, and the longer the annealing the lower is the fatigue limit. This is due probably to the accentuating of the bad effect of inclusions by prolonged exposure to the high temperatures of annealing. Annealing at 760° C. gave more regular results in the fatigue experiments. AHE (10b)

Electric Furnaces for Bright-Annealing Process. H. C. Kloninger, G. Keller & H. Meuche. *Engineering,* Vol. 132, Sept. 18, 1931, pages 390-393.

Condensed from paper entitled "Applications of the Electric Furnace for Non-Ferrous Metals, with Special Reference to the Bright Annealing Process" read before the Institute of Metals, Zurich, Sept. 14, 1931. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 308. LFM (10b)

Case Hardening & Nitrogen Hardening (10c)

Studies on the Formation of Different Carbides with Methane. (Untersuchungen über die Bildung verschiedener Metallkarbide mit Methan.) Rud. Schenck, Fr. Kurzen & H. Wesselcock. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 203, Dec. 30, 1931, pages 159-187; abstract, *Stahl und Eisen,* Vol. 52, June 2, 1932, page 545.

The nature of the action of C on metals at high temperatures was studied. Equilibrium between different C-phases and Fe was found at 0.47, 0.74 and 0.99% C. Action of CH_4 on Cr results in Cr_5C_2 and solid solutions between 600 and 800° C., and Cr_3C_4 and Cr_3C_2 are found under certain conditions. The carbonization of W produces the unstable W_5C_2 and an unstable solid solution phase, which contains in addition to W_5C_2 still another unstable higher carbide, apparently W_3C_2. At 800° C. the stable WC only is formed. Above 800° C. the rate of transformation of the unstable carbide is very high and only a single carbide, the stable WC is formed One stable carbide Mo_2C resulted from action of Mo with CH_4. At 700° C. a metastable phase seems to exist. In the case of Re only a few tenths % of C is taken up by the metal, the reaction with CH_4 being very slow. 12 references. Ha+DTR (10c)

Nitrogenization of Steel by Ammonia and Aging Phenomena. (Azotowanie stali przez amoniak i zjawiska starzenia.) I. Feszczenko-Czopiwski & Wojcik. *Prace Badawcze PWU,* 1931, No. 1, pages 51-122.

48 references. Based on the results obtained it is suggested that the solubility of N in Fe is greater than that indicated by Fry in his Fe-N diagram. The only steels practically suitable to nitrogenization are the Al and Cr steels; although hard C steels containing an admissibly great amount of Si and Mn can be nitrided in some cases. The following conditions were found to be the best for nitriding of Al and Cr steels: 540° C. as the temperature of process, during 30 hours and at 20% of dissociation of ammonia. The next table gives the results of aging of some nitrided steels.

Analysis C%	Cr%	Al%	Hardness in Brinell units after nitriding and hardening	aged during 40 days
0.34	1.6	1.04	800	890
0.36	15.6	...	750	820
0.11	...	...	320	375
0.22	...	...	355	415
0.72	...	...	390	420

The hardening of nitrided steels by aging is more efficient in case of low C steels. The superhardening by means of the Herbert's apparatus "cloudburst" gave more pronounced results as follows:

Analysis C%	Cr%	Al%	Hardness in Brinell units nitrided	nitrided and superhardened
0.25	1.18	0.95	755	900
0.53	0.46	...	515	745
0.11	...	...	320	650
0.51	...	...	460	650
0.72	...	...	390	685

ZJ (10c)

Some Experiments on the Nitrogen-Hardening of Cast Iron. J. E. Hurst. *Iron & Steel Institute, Advance Copy* No. 9, May 1932, 10 pages.

The properties of nitrided Al-Cr cast iron were determined. An iron suitable for nitriding used for cylinder linings is marketed under the trade name of "Nitricastiron." Centrifugally cast and sand cast specimens were used. The former had the greater hardness. The iron was heat treated before nitriding. The nitrided iron had a hardness of 982 and a penetration of 0.018 in. The hardened layer on the centrifugally cast specimen was greater than that on the sand cast specimen, but not as great as the case on Nitralloy. The iron contained 2.6% total C, 2.5% Si, 0.6% Mn, 1.6% Cr and 1.4% Al. The centrifugally cast material contained 1.55% combined C and the sand cast 0.85%. JLG (10c)

What is Carburizing? (Ou en est la cémentation au carbone?) Bernard Jousset. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, Jan. 1932, pages 2-11.

An exposition of advantages and disadvantages of the many existing processes of cementation of steels. GTM (10c)

The Theory and Practice of Nitrogen Case-Hardening. A. Fry. *Iron & Steel Institute, Advance Copy* No. 8, May 1932, 22 pages.

Bibliography of 26 references. Reviews his development of the nitriding process, and discusses some of the recent work on the Fe-N system. The stability of the various nitrides was determined by heating in vacuo. The nitrides of Fe and Mn decompose at comparatively low temperatures. Cr nitride decomposes at about 900° C. Al and Ti nitrides are stable up to at least 1100° C. The extreme hardness of the nitrided layers in special steels is attributed to slip interference produced by nitride particles formed on treatment with NH_3. The case is shallow because of the great stability of the Al and Cr nitrides formed as an extraneous phase in the Fe lattice. If nitriding is carried out at too high a temperature the nitride particles produced are too large to produce a case with the best properties. The nitride particles prevent diffusion of the NH_3 into the steel, and the case is therefore thin. The effects of nitriding on the fatigue limit and corrosion resistance are mentioned. JLG (10c)

Non-deforming Alpha-Delta Carburizing Steels. A. B. Kinzel. *Transactions American Society for Steel Treating,* Vol. 19, Mar. 1932, pages 438-448.

Includes discussion. See *Metals & Alloys,* Vol. 3, May 1932, page MA 132. WLC (10c)

Surface Hardening of Aluminum-Chromium-Molybdenum Steels. W. H. Cunningham & J. S. Ashbury. *Heat Treating & Forging,* Vol. 18, Mar. 1932, pages 178-179, 183; Apr. 1932, pages 248-250; *Engineering,* Vol. 132, Oct. 9, 1931, pages 475-478, 485.

Paper presented before the Iron & Steel Institute. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 309. LFM+MS (10c)

Nitrided Steels and Their Properties. H. A. DeFries. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 28-30.

Paper read before the Conference on Metals and Alloys, Case School of Applied Science, Cleveland, Nov. 1931. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 249. MS (10c)

Case Hardening with Nitrogen. J. E. Magoffin. *Sibley Journal of Engineering,* Vol. 46, Apr. 1932, pages 89-90.

The nature of nitrogen or case hardening is explained and the usual methods are briefly described. A great advantage of nitrogen hardening is that because of low temperature and short time of exposure, no heat treatment of the steel is necessary. Grain growth is avoided and the piece has become stronger by a less expensive process; it equals purely carbon hardened steels. 5 references. Ha (10c)

Rugged and Dependable Nitriding Steel. *Heat Treating & Forging,* Vol. 18, Feb. 1932, page 112.

Union Carbide & Carbon Research Labs., Inc., has developed a nitriding steel containing 0.50-2.50% Cr, 0.30-2.50% V and up to 0.70% C, depending upon physical properties desired. It has many of the physical properties of the S.A.E. 6100 series. About 0.30% V in excess of that required to form VC is necessary, as the presence of this amount of V in the unbound form is important in securing surface hardening with N. Best results are obtained by NH_3 nitriding, particularly where a comparatively heavy case is required. A case as thick as 0.04" can be obtained by this method. MS (10c)

Short-Time Nitriding. John J. Egan. *Transactions American Society for Steel Treating,* Vol. 19, Apr. 1932, pages 481-500.

See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 14. WLC (10c)

Purest Steels Develop Soft Spots if Carburized and Quenched. F. Duftschmid & Edouard Houdremont. *Metal Progress,* Vol. 21, May 1932, pages 30-33, 92.

The authors have produced very pure Fe-C alloys from Fe produced by the decomposition of the carbonyl and pure gas carbon. Such steels show in hypo- and hypereutectoid composition the "abnormal" tendency to agglomerate the cementite. The grain size of such very pure alloys is not small as in commercial abnormal steels which the authors explain by the entire absence of any centers of crystallization in the form of alumina or other non-metallics present in commercial steels. Thermal study shows the hysteresis at A_1 point to be very small. Ac_1 1314° F. and Ar_1 1292° F. The addition of transformation retarding elements to these pure alloys, such as Mn and Cr, have entirely removed the tendency to agglomerate the cementite. The presence of "abnormal" features in badly segregated areas of high S and P is according to the authors due to presence of some regions of very pure Fe. The rapid transformation of pure alloys results in agglomerations of the cementite but slow or retarded transformation due to Mn, Cr or other alloy allows time for the formation of plate pearlite and cementitic grain boundaries in hypereutectoid steels. WLC (10c)

The Loss of Carbon from Iron and Steel When Heated in Decarburizing Gases. A. Bramley & K. F. Allen. *Engineering,* Vol. 133, Jan. 22, 1932, pages 92-94; Jan. 29, 1932, pages 123-126; Feb. 19, 1932, pages 229-231; Mar. 11, 1932, pages 305-306.

Quantitative tests were made to determine the relationship between the extent of decarburization and the C gradient within the steel. Attempt was made to discover whether the removal of C by decarburizing agents is governed by laws similar to those which apply to the introduction of C during the cementation process. Several series of tests were made. The C content of the steels used varied from 0.85 to 2.00%. Tests were made using dry and moist hydrogen and a mixture of CO and CO_2 as decarburizing agents. The results are shown graphically. One series of tests was made to determine the effect of temperature on the rate of decarburization, the temperatures used varying from 800° to 1100° C. An examination was made of the microstructures of the steels treated, photomicrographs being given showing the structure. One section of the paper deals with the application of Fick's law of diffusion to the movement of C in steel. Decarburization tests at various temperatures made on a 2.0% C steel proved that there is a definite maximum solubility of C in the combined state in γ iron, the value of which depends on temperature. LFM (10c)

JOINING OF METALS & ALLOYS (11)

Welding & Cutting (11c)

Transformer Tanks Constructed by Welding. JAMES LYALL. *Welding*, Vol. 3, June 1932, pages 373-374.

Some details of construction and welding procedure for welded tubular type transformer tanks. TEJ (11c)

Gas Welding as a Construction Means in Fokker Aircraft Design. (Das autogene Schweissen als Konstruktionsmittel im Fokker-Flugzeugbau.) H. LEHBERT. *Zeitschrift für Schweisstechnik*, Vol. 21, Oct. 1931, pages 228-238.

In the introduction, Fokker's adoption of welding in his airplane designs is historically reviewed. The welded fuselage as a whole as well as the single welded members as landing gear, rudders, engine mounting, etc., are fully considered and well illustrated. Next the difficulties associated with the welding performance in regard to the rather thin-walled tubes, to welding of differently gaged tubes and to non-destructive tests are critically discussed. The precautions during this kind of welding are summed up. Regarding the most suitable material, the importance of the yield point and weldability are considered. Touches upon the testing of welded aircraft parts and calls attention to the welding of non-ferrous metals and alloys also employed in airplane design. Elektron metal can be welded under certain precautions, while Al offers some difficulties with respect to the strength properties. Cu, brass and bronze are usually soldered. The advantages of welding adopted in aircraft construction are summarized as follows: low weight, simplicity and flexibility of design, unlimited possibilities in repair work, low costs due to mass production. EF (11c)

Welding of Pipe. S. LEWIS LAND (Heating & Piping Contractors National Association). *Journal American Welding Society*, Vol. 11, Mar. 1932, page 11.

A tentative outline for a course in pipe welding. TEJ (11c)

Electrodes and Plates for Pressure Vessels. E. DACRE LACY. *Welding*, Vol. 3, June 1932, pages 351-355.

The author discusses a report of welding investigations made by the British Engine Boiler and Electrical Insurance Co. Ltd. Etched sections of flanges welded on by the metallic arc, carbon arc and forge welding processes are shown and compared. Six different qualities of plate were welded, several types of electrodes being used. Although the use of a good flux coated electrode was found to be advantageous, bare wire may in some cases be preferable to a rod with an inferior covering. TEJ (11c)

The Advance of Electric-Arc Welding. EDWARD DACRE LACY. *Metallurgia*, Vol. 6, May 1932, pages 21-22.

Discusses applicability of welding to ship construction. Predicts extended use when ships are built. JLG (11c)

What does Gas Welding Promise in Bridge Construction? (Was verspricht die Acetylenschweissung im Brückenbau?) H. KRUSE. *Zeitschrift für Schweisstechnik*, Vol. 21, Dec. 1931, pages 281-286.

The favorable elongation and strength properties of oxy-acetylene welded seams with reference to the requirements in bridge construction are emphasized. The writer discusses at length, why a material reduction due to welding is secured and furnishes 2 instructive examples in which savings in material of 13 and 25% respectively were attained by the adoption of welding. Furthermore, inaccurate fitting-together during assembling can easily be eliminated, a greater flexibility from an architectural view-point is possible, simple performance of repair work or later reinforcements, and short times of erecting are the more outstanding advantages of welding. Further examples showing the possibilities of welding in regard to bridge construction are given with the object of revealing the new ways opened by this method of joining. The development of new profiles more suitable for welding are foreseen. EF (11c)

Savings in Maintaining Rail Systems by Means of the Welding Torch. (Ersparnisse bei der Instandhaltung von Eisenbahn Geleise Anlagen mit dem Schweissbrenner.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, Jan. 1931, pages 8-9.

Article critically discusses 3 recent publications on the subject: first that of Tracy stating that gas-welding proved to be materially cheaper than electric-welding for building up battered ends of rails, the average ratio being $0.81 to $2.10 for each welded rail end. The most economically electric-welded rail end amounted to $1.17. With reference to a paper of Titger (*Mitteilung des Neuen Internationalen Verbandes für Materialprüfung*) the writer denies that the gas welding requires 2.2 m.³ oxygen and 1.9 m.³ acetylene per 1 kg. welding material. One m.³ of both gases is sufficient, the welding time being half an hour. Regarding a paper of Schmitt (same reference) a decided superiority of gas welding is claimed. EF (11c)

Some New Suggestions Concerning Welded Vessels and Tubes. (Einige neue Gedanken für geschweisste Gefässe und Röhre.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, Apr. 1931, pages 73-75.

The new method of increasing the strength of a welded boiler with longitudinal and circumferential seams is characterized by the use of a continuous longitudinal strap outside of the shell right on top of the original longitudinal seam. This method of strengthening by a strap can also be applied to tubes and to joints of tubes among each other. EF (11c)

Electric Arc Welding in Ship Construction. J. FOSTER KING & JAMES MONTGOMERIE. *Welding Journal*, Vol. 29, Mar. 1932, pages 83-86, 89.

From an abstract of a paper read before the Institution of Naval Architects, Mar. 16, 1932. The authors briefly relate the history of arc welding as applied to ship construction and give physical properties of deposited weld metal. With good electrodes and proper procedure, weld metal shows 25 tons/in.² T.S. or more and 16 to 18% elongation. The key to good welding is proper relationship between current, size of electrode, mass of material adjacent to the joint, rate of deposition from the electrode and length of run made with each electrode. Proper fit-up is essential and proper inspection is the most important factor in the success or failure of electric welding. Includes discussion. TEJ (11c)

Change of A Rolling Mill Housing with the Aid of Electric Arc Welding. (Änderung eines Walzenständes mit Hilfe der elektrischen Lichtbogenschweissung.) K. JURCZYK. *Elektroschweissung*, Vol. 3, Feb. 1932, pages 33-36.

The paper gives an interesting example of the application of electric arc welding in increasing the width of a rolling mill housing. The welding offered no difficulties though the parts to be welded had a width of 100 mm. GN (11c)

Magnetic Influence on Electric Welding. J. E. KENNARD. *The Welder*, Vol. 3, Feb. 1932, pages 27-28.

Sputtering and blowing of the electric arc occurs fairly frequently and is mostly due to magnetic influence; magnetic fields are set up by the welding current passing through the electrode, the arc and the work, the direction of the magnetic field depending on the direction of the current. The influence of the magnetic field can be reduced greatly by properly placed backing plates or cross pieces of steel to provide better conditions of magnetic reluctance in magnetic paths and get steadier welding conditions. Ha (11c)

The Replacement of Castings by Gas-Welding in Machinery. (Die autogene Schweissung im allgemeinen Maschinenbau an Stelle der Giesserei.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, Nov. 1931, pages 253-259.

The handicaps of castings in regard to the properties of the casting material, to restrictions of design and to complicated making of the pattern and the casting are pointed out. Tests performed in the Eidgenössische Materialprüfungsanstalt, Zürich, yielded for material welded with a low carbon welding rod: elasticity coefficient = 2,150 t./cm²., proportional limit = 2.2 t./cm²., yield point = 2.45 t./cm²., tensile strength = 3.9-4.2 t./cm²., mean elongation = 24%, quality factor = 0.95. Savings of material up to 50% by replacing castings by welded steel are reported. The frame of a surface grinding machine, stamping machine, and gear wheel cutting machine are shown in cast iron and in welded construction. The other illustrations refer to supplementary parts of machinery, to cases of gasoline supply pumps, milling, filing, grinding machines, frame of a hack-saw, under-frame of a butcher shop equipment, drilling machine and a large steel valve. In conclusion the author critically discusses and denies the lower rigidity of welded machinery in comparison with castings. EF (11c)

Gas Welding of Long Vessels. (Die autogene Schweissung von langen Kesseln.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, Dec. 1931, pages 286-290.

Saving of 25% on pressure vessels up to 200,000 liters capacity due to welding are reported. The single steps of the operator's welding performance on such large units including detailed instructions on the making of the manhole, are covered. EF (11c)

Up-to-date Equipment of an Oxy-Acetylene Welding Shop. (Moderne Einrichtung einer Acetylen Schweisserei.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, Mar. 1931, pages 50-54.

Looks first into the more recent viewpoints concerning the most favorable gas pressure, the generation of the acetylene pressure, the utilization of a pressure reducing valve, and the kind of oxygen supply. The balance of the paper pertains to a detailed description of the various features of a modern gas-welding shop. The characteristics of the author's proposals are (1) the acetylene pressure is increased to 1-1.5 atmospheres, (2) a centralized oxygen supply. EF (11c)

Up-to-date Installation of a Welding Shop. (Moderne Einrichtung einer Schweisserei.) *Zeitschrift für Schweisstechnik*, Vol. 21, May 1931, pages 100-107.

Two critical discussions on a previous paper of Keel (see abstract above). The first author lays stress on an equal pressure of O_2 and C_2H_2 and shows an automatic regulator for this purpose. Advantages claimed: the flame need not be adjusted by the welding operator, since the pressure in both gas pipe lines is regulated in a central station. The flash back of the flame is entirely eliminated. The greater economy of the "Uniform Pressure System" is considered at length, based on appreciable savings in time, gas, wages (unskilled operators can be employed). The efficiency of oxy-acetylene welding shops has been increased by 30 % due to this centralized pressure regulation. The second writer in the discussion calls attention to the constant pressure welding equipment of the Carba A. G., Bern, Switzerland, incorporating the principles outlined in Keel's article. EF (11c)

Repair Welding on Cast Iron Water Hydrants. (Reparaturschweissungen an gusseisernen Strassenarmaturen der öffentlichen Betriebe.) H. JÜRGENS. *Gas- und Wasserfach*, Vol. 75, Feb. 6, 1932, pages 108-110.

Discusses the methods, materials, and kinds of welds used in repairing water hydrants in Mannheim, Germany. MAB (11c)

Fusion Welding with a High Pressure Mixture of Acetylene and Illuminating Gas. (Autogen-Schweissen mit einem Hochdruckgemisch von Azetylen und Leuchtgas.) E. KALISCH & W. GIUDICE. *Die Schmelzschweissung*, Vol. 11, Jan. 1932, pages 14-17; Mar. 1932, pages 49-51.

In order to reduce the high cost of welding with pure acetylene, tests were made with a mixture of acetylene and city gas. With the usual low pressure in the gas mains no satisfactory results were obtained but a compression to 3000 mm. water gage and a mixture of 1:1 of both gases gave a good result. Tests are described for welding of sheets from 2 to 14 mm. thickness which gave the same heat consumption and welding velocity with a saving of 10 to 15% against acetylene alone. Similar results were obtained for other ratios of gas to C_2H_2. An installation for this method is described. Microphotographs show the good condition of the weld. Ha (11c)

Comparison between Gas and Electric Welding Costs. (Kostenvergleich autogener und Elektrischer Schweissungen.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, Apr. 1931, pages 75-81.

An economical comparison between oxy-acetylene and arc-welding is fully detailed with reference to prices prevailing in Switzerland. The calculation, which of course is relative, discloses slightly greater cost for electric welding. EF (11c)

Gas Welding in Aircraft Construction. (Die Autogenschweissung im Flugzeugbau.) H. Haeberli. *Zeitschrift für Schweisstechnik,* Vol. 21, Mar. 1931, pages 54-58.

The progress in air-plane design due to the great economy and flexibility offered by gas welding technique is emphasized. Designing a joint connection in wood, steel tubes (two welded designs) and Duralumin (screwed and riveted) are compared, demonstrating the great possibilities of gas welding in aircraft construction. EF (11c)

Discussion of Paper on "Large Welded Everdur Pressure Vessels." Ira T. Hook & M. Powell. *Journal American Welding Society,* Vol. 10, Dec. 1931, pages 36-37.

Discussion of paper presented at the Fall Meeting of the American Welding Society in Boston, Sept. 1931. Paper published in the *Journal American Welding Society,* Vol. 10, Sept. 1931, pages 39-47. See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA43. TEJ (11c)

Weld Ductility Requirements for Welded Pressure Piping. T. W. Greene. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 55-59.

Paper presented at the Annual Meeting of the American Welding Society in New York, April 1932. A ductility of 10% to 12% seems sufficient to meet all requirements of pressure piping. While ductility far exceeding this range can be readily secured in fusion welds, there appear to be no requirements in piping service which would justify the establishment of higher ductility specifications. Strength in the weld metal equivalent to the base material and freedom from imperfections are of far more importance than relative high ductility. TEJ (11c)

A Study of the Transformation Points of Fusion Welded Metal. F. R. Hensel & E. I. Larsen. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 28-32.

Paper presented at the Annual Meeting of the American Welding Society in New York, April 1932. By means of dilatometer readings, A_3 transformation points were determined for bare wire weld metal, coated wire weld metal, atomic hydrogen weld metal, oxy-acetylene weld metal, ingot iron and other steels of varying N content. It was found that: (1) Increasing the N content in the weld metal causes, (a) lowering of the A_3 transformation point, (b) increase in temperature range of α-γ transformation, (c) changes in expansivity above 600° C. (2) The magnetic transformation point is not appreciably affected by a variation of the N content in the weld. (3) The transformational characteristics of various types of weld metal are so altered by a severe hydrogen anneal that they become similar to those of pure Fe. TEJ (11c)

Spot Welding of Stainless Steel as Applied to Aircraft. Carl De Ganahl. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 60-62.

Paper presented at the Annual Meeting of the American Welding Society in New York, April 1932. Cold rolled 18-8 strip having a tensile strength of 175,000 lb./in.^{2} and 10% elongation is fabricated into airplane structure by spot-welding. Carbide precipitation is prevented by carefully adjusting electrode pressure, current and time of current flow. TEJ (11c)

Welding on U. S. S. New Orleans. J. O. Gawne. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 9-22.

Paper presented at the Annual Meeting of the American Welding Society in New York, April 1932. The author discusses the welding being done in the construction of U.S.S. New Orleans, a vessel of 10,000 tons standard displacement. Welding is used in construction of bulkheads, decks and platforms, shell, inner bottom, longitudinals, transverse framing, deck erections, fittings, foundations and auxiliaries. Most of this is direct current arc welding, both bare and heavily coated electrodes being used. Design values for weld metal are 36,000 lb./in.^{2} in tension and 29,000 lb./in.^{2} in sheer. Recent developments making possible welds in medium steel with tensile strength of weld metal superior to and elongation equal to that of the base metal, remove many of the design difficulties in the way of an all-welded war vessel. TEJ (11c)

The Uses of Carbon in Arc Welding. K. L. Hansen. *Welding,* Vol. 3, Apr. 1932, pages 222-225.

A discussion of the applications of arc welding where carbon constitutes one or both of the electrodes. Includes filling in blow holes in castings, description of the Electronic Tornado process and the carbon arc torch. The carbon arc is particularly adaptable for the welding of Cu and its alloys. TEJ (11c)

Welding as Applied to the Electrolux Refrigerator. W. R. Campbell & R. S. Taylor. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 48-52.

Paper presented at the Annual Meeting of the American Welding Society in New York, April 1932. Description of the construction and manufacture of an absorption type household refrigerator unit. There are 78 individual welds in each unit making a total of 150 inches of welding in steel ranging from 17 to 11 gage. Most of the welding is done by the oxy-acetylene process, the welds being made while the parts are moving on a conveyor. TEJ (11c)

Welding of Tool Steels. (Les Aciers à outils et la Soudure.) C. Franche. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, Apr. 1932, pages 147-149.

Brazing and welding of tool steels is briefly discussed. GTM (11c)

Fusion Welding in Steel Structures. (Die Autogen-Schweissung im Stahlbau.) E. Greger. *Die Schmelzschweissung,* Vol. 11, May 1932, pages 100-104.

The construction of a factory building of 87 m. length, 25 m. width and 9.14 total height welded together and the details of design with the procedure of assembling is described and illustrated. Tests made on the joints showed almost the same strength as the parent material. Ha (11c)

Welded Storage Tanks. Orville Adams. *Welder,* Vol. 3, Apr. 1932, pages 25-30.

See "All Welded Oil and Gas Field Storage Tanks," *Metals & Alloys,* Vol. 3, May 1932, page MA 130. Ha (11c)

Welded Barge Construction at Federal Shipbuilding and Dry Dock Company. Gordon G. Holbrook. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 5-8; *Welding,* Vol. 3, May 1932, pages 285-289.

Paper presented at the Annual Meeting of the American Welding Society, in New York, April 1932. A description of an all-welded steel barge design which may be built at a price competitive with wooden construction. The outstanding advantage of the welded barge over the barges of conventional riveted construction lies in the absence of rivets to become loosened, leak and corrode away. 67 to 80% of the welding is done by the automatic shielded carbon arc process. The basic principle of this design is the joining of rolled structural channels with intermediate flat bars, all united with a double seam of electric welding. TEJ (11c)

Rules and Regulations for Electrically Welded Steel Construction in Germany. P. V. Jankov. *Journal American Welding Society,* Vol. 11, Mar. 1932, pages 29-30.

New rules on welded steel construction have been published under the title "Vorschriften für geschweisste Stahlbauten." Explanations to these rules with examples for calculation of welded construction have also been prepared by Dr.-Ing. O. Kommerell and published by Wilhelm Ernst & Sohn. Results of a few tests of welded joints are included. TEJ (11c)

Cutting with Oxygen. (Oxycoupage.) L. de Jessey. *L'Usine,* Vol. 41, Jan. 11, 1932, page 31.

A brief review of the changes taking place in the zones in and near a cut made with the oxygen flame. Micrographic examinations show that the thickness of the tempered zone is not more than 1 mm., that of the transition zone 2 mm. The mechanical properties of a metal cut with oxygen are about the same as a metal worked with tools. An after-treatment is not necessary for mild steels. Ha (11c)

Ductility and Penetration—Two Fallacies. C. J. Holslag. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 47-48.

Paper presented before the Annual Meeting of the American Welding Society in New York, April, 1932. The author believes that enough ductility must be obtained in weld metal to withstand the welding contracting strains, but beyond this it is foolish to go. Penetration in steel other than enough to get good fusion is not desirable. TEJ (11c)

Descriptive History of Covered Electrodes. C. J. Holslag. *Industry & Welding,* Vol. 3, Mar. 1932, pages 22-24.

A short treatment of the reason for covering the welding pencil and the influence of the type of covering on the weld. Ha (11c)

What the Welding Industry Must do to Receive Engineering Acceptance. S. C. Hollister. *Welding,* Vol. 3, May 1932, pages 298-300, 324.

Paper presented before the Thirty-second Annual Convention of the International Acetylene Association. It is the author's opinion that stress distribution and fatigue under repetitive loading are fundamental subjects upon which engineering research must concentrate before welding is generally applicable to engineering structures. An adequate method of field inspection is necessary. TEJ (11c)

Constructing a 500-Gallon Welded Everdur Tank. C. B. Jacobs, Jr. *Journal American Welding Society,* Vol. 11, Mar. 1932, pages 17-18.

Everdur, a readily weldable Cu-Si-Mn alloy possessing the strength of mild steel and having the general corrosion resistance of Cu, is increasing rapidly in use as a tank material. The author describes the procedure used in metallic arc welding of a large Everdur hot water storage tank. TEJ (11c)

The Welding of Bi-Metal. (Ueber Schweissung von Bimetall.) Hans A. Horn. *Autogene Metallbearbeitung,* Vol. 25, May 15, 1932, pages 145-147.

Welding of a bi-metal (composed of a layer of a noble metal united to a base metal by pressure welding and then rolled to the desired thickness) to a similar or different piece of metal was investigated. Recently a third layer is placed between the 2 forming the actual bi-metal in order to maintain the purity of the nobler metal during heating; this third layer has a higher melting point than the 2 other metals. It was found that welding of both sides of the bi-metal is not feasible. The Ag is best welded with Ag and the Cu hard-soldered with an easily flowing flux. In general, it is rather difficult to make a perfect weld with such double or triple metals. Ha (11c)

Modern Spot and Relief or Projection Welders and Their Application to Production Problems. P. W. Fassler. *Journal American Welding Society,* Vol. 11, May 1932, pages 12-15.

Paper presented before the Annual Meeting of the American Welding Society in New York, April 1932. The author traces the development of spot welders and describes the modern spot welding machine. The theory of relief or projection welding and the major variables for a given welding problem are discussed. TEJ (11c)

Why Ductility of Welds is Important in Welded Pressure Vessels. E. R. Fish. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 32-33; May 1932, pages 25-26.

Paper presented at the Annual Meeting of the American Welding Society, April 1932. The author is of the opinion that ductility in weld metal is highly desirable, if not absolutely necessary to assure welds, the integrity of which can be depended on with reasonable certainty. TEJ (11c)

Measuring Methods and Measurements in Electric Arc Welding. (Messmethoden und Messungen bei der elektrischen Lichtbogenschweissung.) P. Flamm. *Elektroschweissung,* Vol. 3, Mar. 1932, pages 50-52.

A new acoustic method has been developed by the author which permits accurate study of the course of welding. Experiments were carried out to test the new apparatus practically. The behavior of various electrodes has been studied under a great variety of conditions. GN (11c)

Electric Arc-Welded Ships' Watertight Transverse Bulkheads. Stanley E. Evans. *Welder,* Vol. 3, Apr. 1932, pages 4-7.

The points to be taken into account in their design are explained and the angle, bulb angle or channel sections used in their construction are described. A diagram for the proper selection of the materials is added. Ha (11c)

Arc-Electric Welding of Aluminum (Ueber das bogenelektrische Schweissen Aluminium). M. ZACK. *Aluminium, Hauszeitschrift V.A.W. und Erftwerk,* Vol. 4, Mar. 1932, pages 75-76.

A new method of welding Al with 3-phase current is described. 2 electrodes are used, one serves mainly for preheating the piece and the other for welding. The welding generator supplies current of 200 to 250 cycles as hereby the arc is more constant than with the usual low frequency; one phase is connected to the piece, the second to a carbon electrode for preheating and the third to an Al-rod for welding. This arrangement gives 3 arcs (joined to a common neutral point) which are independent of each other. The difference between the arc-electric welding and gas welding is that in the former the heating is only local while in the latter a more extended area is heated; this must be taken into account by the welder. Ha (11c)

Sheet Lead Welding Procedure. *Sheet Metal Worker,* Vol. 23, Mar. 18, 1932, pages 124-126, 132.

The various working methods of lead-burning or lead-welding are discussed and illustrated by examples of tank linings and architectural uses, as roofing, spandrels, ornamentation, etc. Ha (11c)

Electric Arc-Welding in the Construction of Buildings in Italy. *The Welder,* Vol. 3, Feb. 1932, pages 14-17.

Technical and economic reasons compelled the evident application of electric welding for large structures as well as for small residence buildings in Italy. Ha (11c)

Gas-Welded Ships on Lake Geneva. (Autogen geschweisste Schiffe auf dem Genfersee.) *Zeitschrift für Schweisstechnik,* Vol. 21, Aug. 1931, pages 182-184.

Diesel engine powered ferry boats of 24 m. length assembled by oxy-acetylene welding are described and illustrated. EF (11c)

Bronze Welding Locomotive Cylinders and Frames. *Welding,* Vol. 3, Jan. 1932, pages 13-14.

Article from data furnished by Air Reduction Sales Co. Tabulation of repair costs of 2 jobs show considerable saving by use of the oxyacetylene welding process. TEJ (11c)

Hard Surfacing Reduces Machinery Maintenance. FRANCIS A. WESTBROOK. *Welding,* Vol. 3, June 1932, pages 355-360.

A number of hard-surfacing applications on mining and crushing machinery. TEJ (11c)

Gas Welded Mine Buggies. (Acetylengeschweisste Gruben Förderwagen.) *Zeitschrift für Schweisstechnik,* Vol. 21, Apr. 1931, pages 70-72.

The weight of mine buggies is greatly reduced, their stability materially improved, the repair work expenses cut from 18 Groschen to 8 Groschen due to the application of welding instead of riveting. Owing to the rugged service in mines the loosening of rivets in former buggies was the source of much trouble. A new design of welded carriages is illustrated. The frame can also be welded. The reduction in weight amounts to 15%. A table is included compiling all the expenses for making a gas-welded and a riveted buggy. The ratio is 362.96 Zloty to 403.94 Zloty in favor of welding, or a saving of 11%. EF (11c)

Welding in Shipbuilding. (Schmelzschweissung im Schiffbau.) *Werft, Reederei, Hafen,* Vol. 12, May 15, 1931, pages 164-166.

General. WHB (11c)

Adoption of Welding Codes Is Stamp of Acceptance. *Steel,* Vol. 90, Jan. 4, 1932, pages 160-161, 170.

The adoption of codes by the various engineering and welding societies approving the fusion welding of unfired pressure vessels and power boilers has given an impetus to structural welding in general. Improvements in welding technique and welding tests, the production of better welding wire, and the perfection of a superior type of heavily-coated electrodes have made possible the production of welds possessing high ductility and high resistance to corrosion. Wider use of welding is anticipated in building construction, shipbuilding, aircraft construction, pipe line construction and other fields. JN (11c)

Gas-Welded Columns Made Up of Shapes. (Autogengeschweisste Säulen aus Profileisen.) *Zeitschrift für Schweisstechnik,* Vol. 21, Oct. 1931, pages 238-241.

Goes into great detail in regard to making columns of shapes joined by welding and illustrates the incorrect and proper accomplishment of the welding operation. A wider use of welding for this purpose is predicted if the multiple flame torch is employed in the making of V-seams and butt seams. The information is based on tests carried out in the Schweisstechnische Lehr und Versuchsanstalt des Österreichischen Acetylenvereins Wien. EF (11c)

The Admissible Straining of Gas Welded Seams. (Die zulässige Beanspruchung von autogenen Schweissnähten.) *Zeitschrift für Schweisstechnik,* Vol. 21, Mar. 1931, pages 58-59.

Urges the substitution of the more up-to-date safety coefficient 0.7-0.8 for the present one of 0.5-0.6 on account of the recent progress of gas welding in case of sheets of 6 mm. thickness and above. Advocates the omission of hammering and annealing of welded seams. The utilization of strengthening straps is accompanied by new stresses. However a ridged (Verdickung) seam is recommended and if a welded rod of greater strength is applied, strength of seam amounts to 0.7-1.0 strength of welded sheet. EF (11c)

Welded Steel Constructions. (Geschweisste Stahlkonstruktionen.) *Zeitschrift für Schweisstechnik,* Vol. 21, Nov. 1931, pages 261-262.

The riveted framework of a continuous silver plating bath is compared with one which is welded. EF (11c)

Stresses Set Up in Cutting and Fusion Welding. (Spannungen beim Brennschneiden und Schmelzschweissen.) *Zeitschrift für wirtschaftliche Fertigung,* Jan. 1932, pages 10-11.

General discussion. GN (11c)

Tests on Welded Seams with Strengthening Straps. (Versuche an Schweissnähten mit Verstärkungslaschen.) *Zeitschrift für Schweisstechnik,* Vol. 21, Aug. 1931, pages 175-177.

Data are reported from tests carried out in the Eidgenössische Materialprüfungsanstalt on samples cut from welded sheets which were provided with a strengthening strap. It is remarkable that fracture exclusively occurred with all samples at some distance from the seam, thus proving that the strength of the welded sheet can be insured by welding methods. A small pressure vessel provided with a "covered longitudinal seam" is discussed and illustrated. EF (11c)

Fusion Welding of the Aluminum Alloys. WM. ROGERSON. *Industry & Welding,* Vol. 3, Apr. 1932, pages 24-30; May 1932, pages 22-26, 32.

The most widely used process for welding Al and its alloys is the oxy-hydrogen or oxy-acetylene method. The equipment required is described. The proper selection of flux is of greatest importance. It must possess the following characteristics: It must melt at a temperature just slightly below Al; in the molten condition it must quickly dissolve or break up the Al oxide with which it comes into contact; the specific gravity of the molten flux containing the Al oxide must be sufficiently below that of the molten Al to insure that it quickly rises to the surface of the weld carrying out all impurities. It must be stable under the temperatures employed and should not deteriorate with age, nor be too deliquescent. The methods of applying the flux, the proper size of welding pencils, handling of the flame and preparation of the seams, are fully explained. Part II. Discusses the care that must be taken in order that the welds be successfully completed without distorting the original shape of the casting; the method is described and it is further explained how to clean and finish the weld. The appearance of a weld in a micrograph is explained. The arc welding of Al, preparation of the piece and electrodes to use are discussed. Ha (11c)

Ductility: A Measuring of Cleanliness. E. CHAPMAN. *Journal American Welding Society,* Vol. 11, May 1932, pages 29-32.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The author shows, by means of photo-elastic studies, stress distribution in various types of welds, explaining why a clean, ductile weld metal is necessary for highly stressed parts. TEJ (11c)

Introducing Welding into a Structural Fabricating Shop. PAUL B. COVEY. *Welding,* Vol. 3, Apr. 1932, pages 231-233, 256-257.

Some problems to be encountered in (1) estimating, (2) design and detailing, (3) fabrication, (4) inspection of welded structural steel, and suggestions as to how they may be solved. TEJ (11c)

Crawler Tractor Construction Improved by Welding. L. R. CANFIELD. *Welding,* Vol. 3, May 1932, pages 296-297; *American Machinist,* Vol. 76, Feb. 11, 1932, page 224.

Description of some welded tractor parts and discussion of the advantages of welded construction. Ha+TEJ (11c)

Fundamentals of Electric Resistance Welding. (Grundlegendes über die elektrische Widerstandsschweissung.) W. BRUECK. *Elektrowärme,* Vol. 2, Apr. 1932, pages 89-91.

The 3 kinds of electric welding methods, butt welding, spot welding and seam welding, are discussed in their different modifications, their proper fields of application, the preparation of the pieces and a few examples are given for comparison with flame welding; especially in chain welding great savings can be made by electric welding. Ha (11c)

British Practice in Welding of Steel Structural Work. JAMES CALDWELL. *Welding Journal,* Vol. 29, May 1932, page 140; *Iron & Coal Trades Review,* Vol. 124, May 27, 1932, pages 880-881.

Summary of a paper read before the International Association for Bridge & Structural Engineering, Paris Congress, May 1932. Welding by means of the oxy-acetylene blowpipe has not met with much support in Great Britain for the assembly and the reinforcement of steel structures, but electric arc welding has developed into general practice. Ha+TEJ (11c)

How Welding Revolutionized a Fast Growing Industry. ERNEST D. CHABOT. *Welding,* Vol. 3, Apr. 1932, pages 220-221.

Because of the many advantages of this type of construction, the steel frames for greenhouses are now practically all welded despite former opposition by florists and growers. TEJ (11c)

Should Metal Work in the Decorative Arts be Fusion Welded? (Sollen kunstgewerbliche Metallarbeiten autogen geschweisst werden?) HANS CASSE. *Die Schmelzschweissung,* Vol. 11, Apr. 1932, pages 70-71.

The question is emphatically answered in the affirmative and several examples illustrate the trend. Ha (11c)

Redesigning Fitted Pipe Lines for Welding. A. L. BYFIELD. *Welding,* Vol. 3, May 1932, pages 311-314.

Redesigning screwed and flanged pipe lines for welding has been characteristic of the last 2 or 3 years during the transition period from fittings to welded joints. Many pieces are eliminated and much weight saved through the application of manufactured welded pipe fittings. TEJ (11c)

The Distribution of Stress in Fillet Welds. G. N. BORROW. *Welder,* Vol. 3, May 1932, pages 33-36.

The different forms in which a fillet weld can be made are discussed and 6 papers referred to for the calculation of the stresses. Ha (11c)

Use of Welding in Plate Fabrication. T. F. BRIGHT. *Journal American Welding Society,* Vol. 11, Mar. 1932, pages 5-10.

Paper presented at the Jan. 8th meeting of the Chicago Section of the American Welding Society. Discussion of the transition from riveted to all-welded gas holders and the relative merits of the caulk welded and tool caulked joints. It is believed that the provision for caulk welding in the A.S.M.E Fusion Welded Code for Unfired Pressure Vessels should be revised. The author gives his experience in changing over from bare to covered electrodes and suggests a way to accomplish this change. Test procedure for new electrode is given. TEJ (11c)

Some Limiting Factors in Metallic Arc-Welding. E. V. BOORNE. *Welder,* Vol. 3, Apr. 1932, pages 18-20.

The means by which arc-welding, and particularly manual welding, may be speeded up to reduce manufacturing costs is discussed. The only means would be the application of higher currents, either with higher current densities in the usual electrodes of No. 4 S.W.G., or with larger electrodes of ¾" to 1" diameter. The nature of the metal to be welded is an important factor in this as great metallurgical changes due to the greater heat produced must be avoided. A higher degree of heating would also result in a more rapid degree of cooling and would have a harmful effect on the grain structure which can only be remedied by a process of normalizing which in practice would usually be impracticable. Speeding up the welding process is therefore connected with certain dangers which in every case should be given most careful consideration. Ha (11c)

Ductility in Metal Structures. C. A. ADAMS. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 46-47.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The author discusses ductility of metal, particularly weld metal and stresses the importance of obtaining weld metal having a certain amount of ductility. For many types of structure high ductility is not essential. Our knowledge of the importance of ductility is very limited. Further research in this field is necessary. TEJ (11c)

Duralumin Tanks with Riveted Joints—Comment. F. V. HARTMAN. *Machinery,* Vol. 38, Jan. 1932, page 398.

Discussion of "Points on Making Duralumin Tanks with Riveted Joints" published in *Machinery,* Oct. 1931, page 135. Duralumin sheets used in aircraft work are always heat-treated to improve their mechanical properties and also their resistance to corrosion. Al tanks do not corrode at welded joints if properly welded. Rivets should be heat-treated. They should be driven before they age. RHP (11d)

The Effect of Ductility on Security in Welded Connections—Methods of Its Measurement. D. ROSENTHAL. *Journal American Welding Society,* Vol. 11, May 1932, pages 5-9.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. Overstressing may occur in a welded joint during the shrinkage following fusion or under applied loads in service. The author describes notch tests and X-ray diffraction patterns of welds varying in ductility. To prevent overstressing, both the parent and deposited metals must be ductile. The more ductile they are, the safer the structure. The notch test seems to be the most suitable for measuring the effect of overstressing in welds. TEJ (11c)

Automatic Resistance Welding Machines. (Selbsttätige Widerstand-Schweissmaschinen.) E. RIETSCH & S. SANDELOWSKY. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Apr. 9, 1932, pages 375-376.

Describes construction and operation of a few modern automatic welding machines of the A E G—Berlin. Ha (11c)

The Arc Welding of Structural Steel. J. H. PATTERSON. *Welding Journal,* Vol. 29, May 1932, pages 147-148; *Welder,* Vol. 3, Apr. 1932, pages 8-15.

Paper read before the Institution of Welding Engineers, London, March, 1932. The paper discusses the reasons for the growth of arc-welding, its weakness, the precautions necessary for welding practice and special problems encountered. The regulations issued by the British Corporation of Welders require the following standards of mechanical behavior of the weld metal: tensile strength 26-29 tons/in.^{2}, elongation 16-20% in 8 in., bend 120° on a standard test piece without showing surface flaws, impact value of 20-35 ft.-lb., and fatigue limit 11-13 tons/in.^{2} A few examples of tests made on building structures are cited. TEJ+Ha (11c)

The Welding of Copper with the Oxy-Acetylene Flame. L. C. PERCIVAL. *Welding Journal,* Vol. 29, Apr. 1932, pages 102-104; *Industrial Gases,* Vol. 13, Mar. 1932, pages 5-9.

Paper read before the Members of the North-Western Branch of the Institution of Welding Engineers, March 15th, 1932. After a brief outline of the metallurgy and physical properties of Cu, the author describes proper Cu welding procedure. The welding rod is of deoxidized Cu. A neutral flame is used and a suitable flux is necessary. Ordinary Cu contains a small amount of copper oxide which is detrimental to good welding. Advantages of Cu and Cu welding are cited. Includes discussion. DTR+TEJ (11c)

Ductility: What is Its Significance? How Test for It? H. F. MOORE. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 35-36; discussion, May 1932, page 26.

Paper presented at the annual meeting of the American Welding Society in New York, Apr. 1932. Discusses the mechanism of failure of metals due to repeated stress. It is highly necessary that welded joints, including the weld metal, the base metal and the metal in the junction zone, should be ductile. It is necessary that the metal should have ordinary ductility for steady loads and to withstand the strains of erection, and as the use of welding is extended to pressure vessels, tall buildings, railway structures and some machine parts, it is becoming increasingly necessary that welds should have "crackless plasticity." TEJ (11c)

A Welding Magna Charta. H. M. PRIEST. *Industry & Welding,* Vol. 2, Oct. 1931, pages 2-6.

Report of the American Bureau of Welding. See "Strength of Structural Welds," *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 42. Ha (11c)

Load Chart for Fillet Welds. V. A. PRINCE. *The Welder,* Vol. 3, Feb. 1932, pages 34-36.

A chart is given for the determination of allowable loads per inch of fillet welds without resorting to the necessity of obtaining the throat dimension and making the subsequent calculation. The chart shows the loads for fillets from ⅛ to ½". Ha (11c)

Arc Welding Oil and Gas Pipe Lines. HAROLD C. PRICE. *Welding,* Vol. 3, May 1932, pages 315-317.

The author gives some interesting data based on experience of arc welding over 1000 miles of steel pipe. TEJ (11c)

Thyratron Control for Resistance Welding Machines. SAMUEL MARTIN, JR. *Welding,* Vol. 3, May 1932, pages 293-295; June 1932, pages 361-363, 366.

Thyratron tubes used as current interrupters for continuous spot welding give a greater number of interruptions per minute and do away with contacts or moving parts in the power lines. The author describes the general theory and characteristics of the thyratron tubes and their application to resistance welding. Part II. With the aid of wiring diagrams, the author explains the operation of thyratron tubes as applied to current control in resistance welding. Oscillograms show results obtained. TEJ (11c)

Mechanical and Physical Properties of Weld Metal. J. H. PATTERSON. *The Welder,* Vol. 3, Feb. 1932, pages 6-10.

The harmful influence of oxygen and particularly nitrogen in welds when made with bare wire electrodes is shown in curves from tests made by several authors; to eliminate this harmful influence coated electrodes are now universally used. The mechanical properties of welds made with different kinds of coated electrodes are given in a table. Ha (11c)

Oxy-Acetylene Welding and Cutting. STUART PLUMLEY. University Printing Company, Minneapolis, 1931. 2nd edition. Cloth 7½ x 11 inches, 410 pages. Price $5.00.

The purpose of the book is two-fold in that it is a manual for instructing the beginner in the operation of the oxy-acetylene torch regulators, cylinders, in general equipment, and a course of instruction for the beginner in welding various classes of metals. It is also an instruction book on the best methods for welding carbon and alloy steels and all metals of the non-ferrous group such as aluminum, copper, nickel, etc. Plant lay-outs and the details of generator design are shown, also job shop cost systems and instructions in the managerial side of job shop welding. Other items of interest include lead burning methods of building up surfaces for resistance to wear, methods for cutting copper and alloys, and other miscellaneous data. The important part of codes relating to welding as applied to boilers and pressure vessels such as the A.S.M.E., Department of Commerce, Underwriter's Rules, etc. are given. Also the methods adopted for welding tanks, pipe lines and aeroplane parts are described and illustrated. A great deal of valuable information covered by tables is also included. C. A. McCune (11c)-B-

Welding Torches with Several Flames. (Schweissbrenner mit mehreren Flammen). E. ZORN. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Apr. 24, 1932, pages 225-226.

A welding torch has to fulfill the following purposes: (1) preheating of the base material, (2) melting of the base metal, (3) preheating of the filling material, (4) melting of the filling material. Since a welding torch has to fulfill these procedures simultaneously its efficiency is impaired; therefore, welding torches have been devised which are equipped with several flames to effectively meet the above requirements. There are described welding torches with several flames as constructed by the Griesheim Works of the German Dye Trust. There is in particular pointed out that such welding torches essentially increase the velocity of welding. Examples as to the successful application of such torches are given. The historical development of torches with one or several flames is briefly sketched. GN (11c)

A Reply to the Discussion on Paper by Wilmer E. Stine on "Factors Affecting the Weldability of Steel." W. E. STINE. *Journal American Welding Society,* Vol. 11, Mar. 1932, pages 18-20.

Stine's paper was presented at the 1931 Fall Meeting of the American Welding Society and was published in the Journal of the American Welding Society, Vol 10, Sept. 1931. The author explains more fully some of the points mentioned in his paper and answers some of the criticisms. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 71. TEJ (11c)

Comments on Reply by Mr. W. E. Stine to the Discussion of His Paper on Factors Affecting the Weldability of Steel. F. T. LLEWELLYN. *Journal American Welding Society,* Vol. 11, Mar. 1932, page 20.

Llewellyn defends his previous statements made in his original discussion of Stine's paper. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 71. TEJ (11c)

Standards for the Pipe Welding Industry. JOHN ZINK. *Industry & Welding,* Vol. 3, Mar. 1932, pages 6-11.

Directions are given for fillet welds and miter welds; throat thickness, fusion width and shape are specified; a fillet weld should be designed not only to close or fill-in a void, but as a strength weld. This type of weld is useful for the manufacture of auxiliary assemblies such as pipe hangers, supports, etc. Ha (11c)

Testing of Electrical Welds and Usefulness of Shielding Welding Rods in the Ehn's Cementation Test. (Prüfüng elektrischer Schweissungen sowie der Brauchbarkeit der Ummantelung von Schweissstäben durch die Ehnsche Zementations Probe.) WERNER ZIELER. *Stahl und Eisen,* Vol. 52, Mar. 10, 1932, pages 236-239.

Effect of various atmospheres on normal structure of weld seam are discussed and it is demonstrated that those atmospheres which produce a good weld seam, also yield a normal cementation structure. Condensed summary of literature is given. Sufficient structure micrographs are included to show that Ehn's Cementation is a valuable means for testing weld seams as well as demonstrating usefulness of providing shielded atmospheres around electrodes. DTR (11c)

Welding Cast Iron Locomotive Cylinders. JAMES M. VOSSLER. *Welding,* Vol. 3, Apr. 1932, pages 217-219, 225; May 1932, pages 290-292.

With proper preheating and proper control of cooling, the deposited metal and the adjacent parent metal will be of the same degree of softness as the rest of the casting. To preheat properly, the casting must be enclosed in a properly built furnace. The author describes in detail the design and erection of such a furnace and also gives valuable pointers on preheating. Part II. The author describes the proper oxy-acetylene equipment to use, the welding procedure to follow and how to cool off the casting in order to consistently obtain good results. TEJ (11c)

Welding of Non-Ferrous Metals. (Schweissung von Nichteisenmetallen.) Symposium held by the Deutsche Gesellschaft für Metallkunde and the Fachausschuss für Schweisstechnik of the Verein deutscher Ingenieure. *Zeitschrift für Metallkunde,* Vol. 24, Jan. 1932, pages 11-22.

Welding of Copper. (Praxis der Kupferschweissung.) E. WEESE. Pages 11-15.

Report upon the tensile strength and elongation of Cu welds; repair of locomotive fire boxes; all-welded fire-boxes; Cu-welding in chemical industries; experiments in arc welding; influence of Mn; X-ray radiography.

Welding of Nickel. (Die Nickelschweissung.) C. CANZLER. Pages 15-18.

Gas welding of Ni; influence of Mn; "arcatom" welding; "arcogen" welding; welding of Monel metal; pressure welding; practical applications.

Autogenous Welding of Aluminum and Its Alloys. (Das autogene Schweissen von Aluminium und seinen wichtigeren Legierungen.) H. BUCHHOLZ. Pages 19-22.

Welding of Al; microstructure of weld; corrosion of weld; welding of condenser by special method; welding of cast alloys; welding of aged alloys. RFM (11c)

WORKING OF METALS & ALLOYS (12)

Melting & Refining (12a)

Bessemer Process and its Product. RICHARD S. MCCAFFERY (University of Wisconsin). *Blast Furnace & Steel Plant,* Vol. 19, Nov. 1931, pages 1448-1450, 1454; Dec. 1931, pages 1566-1571; condensed in *Fuels & Furnaces,* Vol. 9, Nov. 1931, pages 1273-1276, 1292; *Engineering,* Vol. 133, Feb. 19, 1932, page 235. 1

Paper read before the American Iron & Steel Institute, Oct. 23, 1931. See *Metals & Alloys,* June 1932, page MA 178. MS (12a)

Experiments on the Production of Malleable Pig Iron in the Brackelsberg Furnace by the Use of HK-Special Pig Iron. (Versuche über die Herstellung von Temperrohguss im Brackelsbergofen unter Verwendung von HK-Sonderroheisen.) M. PASCHKE & K. LANGE. *Die Giesserei,* Vol. 19, Jan. 22, 1932, pages 23-27. 2

The principal characteristics of the HK-special pig iron are very high C content, low Si content and a very low content of metallic Al. This composition made it very suitable for the production of malleable Fe, and illustrations show the very clean and exact castings obtained with it, due to its fluidity. The amount of waste was considerably reduced by melting this HK-iron in the Brackelsberg furnace. Ha (12a)

Electric Steel Furnaces in Belgium. (Les fours électriques à acier en Belgique.) R. PITAVAL. *Journal du Four Electrique,* Vol. 41, Mar. 1932, pages 91-92. 3

With the small production (15,500 tons in 1930) of special steels Societe John Cockerill and Socite d'Ougree-Marihaye found it to be much cheaper to use basic convertor-electric furnace duplex process than to build open hearth furnaces for production of the same quality of metal. JDG (12a)

Consumption of Brickwork Lining and Changes in Operating Conditions During a Converter Run. (Ueber den Verschleiss der Ausmauerung und Aenderungen der Betriebsverhältnisse während einer Konverterreise.) J. POSTINETT. *Stahl und Eisen,* Vol. 52, Apr. 28, 1932, pages 405-409. 4

Report 228 of Steel Mill Committee of Verein deutcher Eisenhüttenleute. Includes discussion. Test results illustrate consumption of converter lining in the course of the run. Causes are both mechanical and chemical. The brickwork of the main converter shell is protected against wearing away by the practically motionless steel bath. Chief causes which eat up the lining are: (1) mechanical agitation; (2) chemical attack in horizontal position of converter charge on the finish blow, which is so much greater if the slag does not have an excess of lime; (3) air, passing up from the bottom over the bath in the horizontal position of converter, burns the tarry components of the back lining. Tar-dolomite mixtures were used for lining around tuyères and after being set on converter bottom, tar-dolomite was poured all around tuyères and bottom. The bottom when burned was 45 to 50 cm. and lasted 45 to 50 charges. Graphs are given showing converter volume, bath, blowing time, rotating cross-section and weight against number of charges. In order to improve operating conditions during the blowing period it is recommended that the lower section of the converter be enlarged, best into an approximate ball shape. The weight of converter may then be decreased, and this in turn reduces construction costs. DTR (12a) 5

Desulphurization of Cast Irons and Steels by the Means of Acid and Basic Slags. (La desulfurations de la fonte et de l'acier au moyen de laitiers acides et basiques.) A. POSSENTI. *Revue de Metallurgie,* Vol. 28, May 1932, page 287. 6

See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 18. JDG (12a)

Practical Hints in Melting Silumin. (Praktische Winke beim Schmelzen von Silumin.) *Zeitschrift für gesamte Giessereipraxis,* Vol. 53, Mar. 20, 1932, pages 125-126.

In melting silumin the following points are to be considered: (1) the raw material, (2) the melting process which is suitably done in crucible furnaces, (3) the refining process with sodium. For refining 25 kg. of silumin 18 g. of sodium are used. The sodium is enclosed in an Al foil which is dipped in the molten silumin till the refining process is completed. GN (12a) 7

The Open-hearth Furnace as a Melting Medium for Malleable Cast Iron. G. R. SHOTTON. *Foundry Trade Journal,* Vol. 46, Mar. 24, 1932, pages 195-196.

Deals with the construction of the open hearth furnace and the working methods employed in the manufacture of malleable cast iron. The use of such a furnace is rare in Great Britain due to its high cost of installation and also its high cost of production unless working near maximum capacity. OWE (12a) 8

Manganese Equilibrium in Production of Steel in the Open-Hearth Furnace and its Practical Application. (Das Mangangleichgewicht bei der Stahlerzeugung im Siemens-Martin-Ofen und seine praktische Anwendung.) EDUARD MAURER & WILHELM BISCHOF. *Archiv für Eisenhüttenweisen,* Vol. 5, May 1932, pages 549-557; *Ergebnisse der angewandten physikalischen Chemie,* (1), 1931, pages 109-197. 9

A review, summary and discussion of the literature on Mn equilibrium for both acid and basic steel methods. In the acid method the effect of SiO_2 and CaO, and in the basic method the effect of CaO, SiO_2, MgO, Al_2O_3, and P_2O_5 on the Mn equilibrium are given, as well as effect of temperature. In the 2 methods are summarized the relation between Mn content of the steel and amount of Mn in charge, composition and amount of slag. Values based on theory according to mass action law were compared with values found in practical operation and agreed well. Use of Mn equilibrium for red-short tests, rolling scrap, and physical properties of the steel was explained. 33 references. Ha + DTR (12a)

Partition of Manganese Slag to Steel. Correspondence from E. MAURER & W. BISCHOF, Freiberg, Germany. *Metal Progress,* Vol. 21, Mar. 1932, pages 66-68. 10

A report on research to determine variations in the value of $k = Mn(metal) \times Fe(slag)/Mn(slag)$ with variation in slag analysis for the reaction $FeO + Mn \leftrightarrow MnO + Fe$. Portions of equilibrium diagrams are reproduced. WLC (12a)

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On the Origin of Non-metallic Inclusions in Steel. (Ueber die Enstehung von nicht metallischen Einschlüssen im Stahl.) F. Latta, E. Killing & F. Sauerwald. *Kohle und Erz,* Vol. 29, Mar. 1, 1932, pages 64-66.

In studying the origin of non-metallic inclusions in steel, the authors carried on experiments on the velocity with which inclusions of fire clay and open hearth slag ascenu in the steel bath. Furthermore, they examined the occurrence of inclusions which are caused by the deoxidation process. The results indicate that the velocity with which foreign particles ascend in the steel bath is rather considerable, provided they are not present as small flakes. The velocity of separation of foreign inclusions is high in particular when the foreign particles coagulate to larger aggregates. At least the particles of fire clay and open-hearth slag disappeared from the steel bath much quicker than is to be expected from Stokes' law. The lively motion within the steel bath probably affects the separation to a large extent. In spite of the rapid separation it could be shown that the number of the inclusions decreases with increasing casting temperature. It may be, however, that this occurrence is related to the circulation within the bath, being slower in a colder steel. The separation of inclusions which are the products of the deoxidation process takes more time than that of the above artificial inclusions. The latter tests furthermore indicate that the velocity of the chemical reactions of deoxidation must be considered to arrive at correct conclusions. 3 references. GN (12a)

Addition of Sand to Thomas Slag. (Ueber den Sandzusatz zur Thomasschlacke.) Edgar Spetzler & Albrecht Harr. *Stahl und Eisen,* Vol. 52, Apr. 21, 1932, pages 389-392.

Report 227 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. Following data represents Thomas slag analysis with and without addition of dry sand:

	Sand added	Total P_2O_5	% P_2O_5 soluble in citric acid	% Slag soluble in citric acid	% Fines in Slag	SiO_2	Factor $\frac{SiO_2}{P_2O_5}$	% Si in Pig Iron
Ordinary practice	Yes	16-18	15-16	90-92	78-80	8.0	0.45-0.5	...
Test 1	No	16.4	15.4	93.9	79.7	6.4	0.39	0.35
Test 2	No	16.6	15.0	90.8	78.4	6.1	0.37	0.31
Test 3	No	17.7	14.8	83.4	77.1	6.9	0.39	0.36
Test 4	Yes	17.0	15.6	91.8	75.1	9.1	0.536	0.36

Solidification of Thomas slag takes place in so many ways that solubility of P_2O_5 could not possibly be regularly uniform. P_2O_5 solubility is not dependent on definite $\frac{SiO_2}{P_2O_5}$ factors. Addition of sand to converter results in higher ferromanganese consumption to produce deoxidation. Average of 363 melts when sand was added required 11.5% more Mn than melts without sand. Sand also interferes with desulphurization as shown by average of 20 melts. 51% of total S was removed without, and only 37% with sand. Sand also increases amount of time spent in repairing and making new tap hole plugs. Time saving of 32% is made without sand addition. Apparently sand addition gives poor overall operation. DTR (12a)

Modern Converter Practice. W. R. Cooper. *Foundry Trade Journal,* Vol. 46, Apr. 7, 1932, pages 219-220.

Discusses at considerable length the value of the Tropenas converter in the production of steel castings and the methods employed in controlling heats. Particular attention is given to the control of S in steel. OWE (12a)

The Production of Basic Open-Hearth Steel in United States by the Duplex Method using Talbot Furnaces. (Die Erzeugung basischen Siemens-Martin-Stahles nach dem Duplexverfahren in Verbindung mit Talbot-Oefen in den Vereinigten Staaten von Nordamerikn.) E. Goebel. *Stahl und Eisen,* Vol. 52, Apr. 7, 1932, pages 340-344.

Summary of American production methods for basic open-hearth steel. Production of this class of steel by duplex method is carried out in acid converters with basic open-hearth tilting furnaces. Duplex method is subdivided into the lime method and limestone method. In the former method calcined lime is used as flux, while in latter unburned limestone is used. Limestone method is superior, producing steel of slightly better physical properties. Up to present time no definite comparison of physical properties relating to strength has been evolved for steel produced by duplex method and steel produced by pure basic open-hearth method. However, tests are under way on this matter. From American practice the duplex method in producing commercial brands of steels has been found cheaper than the scrap pig-iron method. Tonnage of an open-hearth plant may be varied within wide limits if the possibility exists of applying duplex method. Complete operating data using duplex method are given. DTR (12a)

Duplex Operation: Cupola-Electric Furnace. (Marche duplex: cubilot-four électrique.) Albert Kayl. *Journal du Four Electrique,* Vol. 41, Apr. 1932, pages 130-132.

Many years practice showed that for speeding production about 25%, reducing the cost and preparation of a better steel for casting the use of the molten Fe from the cupola is advantageous in making electric furnace heats. Usually 73% scrap and 27% molten Fe were charged in a 4 ton furnace. A detailed description of the operation and costs is given. JDG (12a)

Modern Trend in Steel-Making Practice. Josiah W. Jones. *Iron & Steel Industry & British Foundryman,* Vol. 5, Nov. 1931, pages 45-49.

Developments in the Bessemer process are few and of little importance. The trend in the open-hearth practice is to explore the physical, chemical and mechanical operations with the view to determine the quantities and the time factors involved. CHL (12a)

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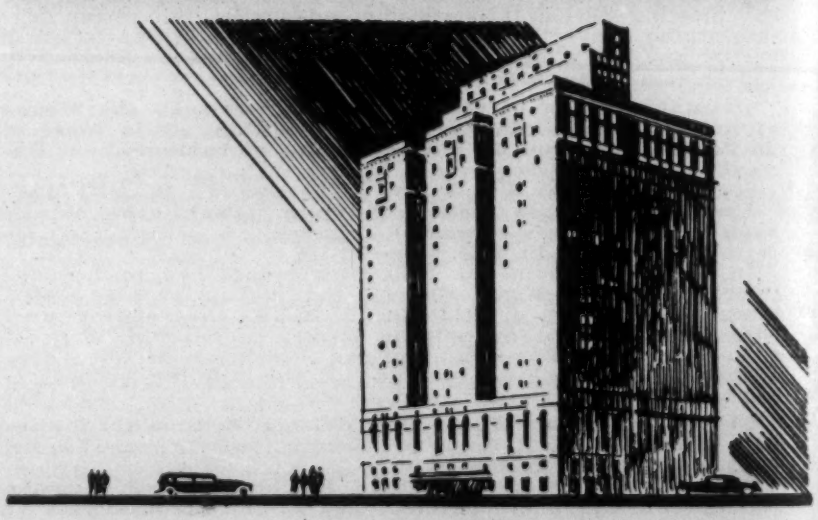

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Casting & Solidification (12b)

The Draw in Small Castings. (Les Tassements dans les Petites Pièces.) L. Gasquard. *Revue Fonderie Moderne,* Vol. 26, Apr. 10, 1932, pages 113-116.

The draw or sinking of a casting is a defect which occurs during the solidification of the metal and is characterized by a deflection towards the upper part of the cast piece. It is usually explained that the poured metal in its contact with the walls of the mold cools suddenly by closely taking the shape of the mold; the solidification of the rest of the system takes place gradually in the remainder of the liquid. If an element is present which interferes with the law of cooling the solidification of the liquid which is still in the interior of the already solidified parts due to the contact with the walls can only take place by causing a draw or sinking. 2 reasons in particular cause this phenomenon: the chemical sulphurization occurring during melting and the sulphurization produced at the moment of pouring into the mold due to the materials employed. In order to avoid this defect which is more prevalent in small than in large castings it is advisable to use a great percentage of new pig iron, not to employ mottled iron or white iron, to use an excess of limestone or lime and fluorspar, hard coke of less than 1% S, to use scrap only judiciously and removing from it pieces of steel and pieces too strongly oxidized, to calculate the charge carefully with respect to contents of Si and Mn, to deoxidize the melt properly with Al or Ti-thermite and to add the Mn with the ladle in the form of powder which promotes the separation of S as MnS. The draw is usually a rough cavity and in taking off the crust in machining a metal of heterogeneous grain and of slight resistance is found. Micrographs, chemical analyses and testing methods for S are given. Ha (12b)

Properties of Steel Ingots as Affected by Conditions of Preparation.—The Harmet Method. (Untersuchungen über die Eigenschaften von Stahlblöcken in Abhängigkeit von den Herstellungsbedingungen unter besonderer Berücksichtigung des Harmet—Verfahrens.) Walter Eicholz & Johannes Mehovar. *Archiv für das Eisenhüttenwesen,* Vol. 5, Mar. 1932, pages 449-469.

Report 222 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion, 20 illustrations, 6 tables of data, and 38 references. (1) An explanation is given for the formation of visual cracks and of behavior on solidification of steel, mechanically still in motion. Effect of conditions of operation on cracks is pointed out. (2) In agreement with Klinger's work, solubility of CO in steel in any appreciable amount under ordinary casting conditions is viewed as improbable, and the explanation for the many phenomena in the formation of external cracks or blow-holes may be given by the reversible reaction $FeO + C \rightleftharpoons Fe + CO$. (3) Herzog's opinions from his research work were practically confirmed; formation of visual cracks and blow-holes during solidification is to be attributed to the mechanical action of steel movement during solidification. (4) Characteristic properties of almost motionless steel, as well as distinction between continuous casting and single casting on the side were studied. (5) After a summary of most important factors in formation of primary structure of motionless steel, comparisons were made between ordinary ingots and those prepared by the Harmet method. (6) Completely sound ingots can always be made with certainty by the Harmet method, confirming Kriz's work, even with alloyed steel. The real advantage of the Harmet method consists in positive avoidance of axial cracks together with the finer cast structure in center of ingot and lack of strong liquation. (7) The large latitude of possibilities for primary cast structure by Harmet's method and its extensive adaptability to the properties of various classes of steel were demonstrated. (8) Chemical and physical action of mold wash with definite ingot sizes are given. (9) Properties of concave castings for manufacture of seamless tubes of large diameter and limited wall strength are described. DTR (12b)

The Separation of Graphite in the Crystallization of Cast Iron. S. S. Steinberg & K. A. Malyshev. *Metallurg* (Russia), Vol. 6, 1931, pages 123-129.

The separation of the graphite was investigated in relation to the raw material (white or gray iron), the super-heating of the Fe, the duration of such heating, and the velocity of cooling. Graphite separates from liquid cast Fe in 3 forms: (1) in the form of a graphite eutectic consisting of very fine graphite laminae (0.01 mm.), (2) in larger leaves (0.1 mm.), and (3) in the form of large aggregations and nests. Super-heating the Fe to 1600° C. and keeping it in the liquid condition a long time decreases the amount of graphite separating and favors the formation of the fine graphite eutectic. Slow cooling during the period of crystallization increases the amount of graphite separating and favors the formation of the coarser formations. After re-melting the gray metal yields more graphite than the white. (12b)

Calculation and Measurement of the Volume of a Pipe. (Berechnung und Messung des Lunkervolumens.) P. Kroll. *Revue Technique Luxembourgeoise,* Vol. 24, Jan.-Feb. 1932, pages 18-19.

3 simple formulas are developed by means of the specific volume-temperature diagram showing the 3 physical states of the metal, that is, solid, doughy and liquid, which permit the exact study of the volume of each pipe formed in an ingot in order that conditions may be altered so that the pipes become a minimum. Ha (12b)

The Formation of Graphite in Cast Iron. H. Hanemann. *Foundry Trade Journal,* Vol. 46, Apr. 7, 1932, page 223.

An extended abstract of a paper which appeared in *Stahl und Eisen,* Vol. 51, 1931, pages 966-967. See *Metals & Alloys,* Vol. 2, Dec. 1931. page 313. OWE (12b)

Progress in the Construction of Die-Casting Machines. (Fortschritte im Spritzguss-Maschinenbau.) A. Kaufmann. *Zeitschrift Verein Deutscher Ingenieure,* Vol. 76, Jan. 30, 1932, pages 105-107.

The development of the last 5 years in machines for die-casting of Al, Zn and brass are discussed. A few details of such machines are given. Ha (12b)

Design of Die Casting Machinery. Correspondence from Sam Tour. *Metal Progress,* Vol. 21, Apr. 1932, page 75.

Comments on Ernst Seidewitz' article dealing with die casting machinery in the January *Mechanical Engineering.* Tour points out that the danger from squirting molten metal increases when parting lines of die are horizontal. WLC (12b)

Modern Casting Cars for Bessemer Steel Plants. (Neuzeitliche Giesswagen für Thomas-Stahlwerke.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 134-137.

This is an illustrated description of steel casting cars as they have been built and improved in recent years by the Demag Company, Duisburg, Germany. GN (12b)

Normal and Inverse Ingot Segregation of Aluminum-Copper Alloys as dependent on the Velocity of Solidification. (Die normale und umgekehrte Blockseigerung von Aluminium-Kupferlegierungen in Abhängigkeit von der Erstarrungsgeschwindigkeit.) H. Bohner. *Aluminium, Hauszeitschrift V. A. W. und Erftwerk,* Vol. 4, Jan.-Feb. 1932, pages 24-30.

The influence of different, exactly defined cooling velocities on the segregation of Cu in Al-Cu alloys in round bars is investigated. The tests lead to the conclusion that the normal and the inverse segregation respectively is a function of the freezing velocity. It can be demonstrated that with increasing cooling velocity at first a normal, gradually increasing segregation takes place which changes after exceeding a definite velocity of heat conduction into the inverse segregation where with increasing cooling velocity the differences in the Cu content between edge and core of the bar become smaller. The differences in Cu-content between edge and core are reduced at both inverse and normal segregation by diffusion phenomena which are independent of temperature and duration. The Cu content of the edge zone is further influenced at the end of the solidification by the squeezing out of the remaining melt to the ingot surface. 13 references. Ha (12b)

Eliminating the Shell Defect in Ingot Molds. D. J. Thomas. *Iron & Steel Industry & British Foundryman,* Vol. 5, Mar. 1932, pages 231-232.

Shell defect is a very thin layer of Fe in the form of a light scab often extending the entire length of the mold and situated always in the 4 angles of radii. It is caused by segregation of phosphide eutectic. Equalizing solidification through design of core bar eliminates this difficulty. See also *Metals & Alloys,* Vol. 2, Dec. 1931, page 319. CHL (12b)

Experiments on Segregation in Steel. J. H. Andrew & D. D. Howat. *Journal Royal Technical College* (Glasgow), Vol. 2, Jan. 1932, pages 608-612, 613-620.

Experiments have been carried out on small ingots of steel containing an excess of impurities. It is shown that the impurities tend to float upwards into the head of the ingot if the steel is kept quiescent for a prolonged time in the molten state. When the ingot is stirred immediately previous to solidification, no segregation is produced, showing that differential solidification does not play the part usually assumed in the phenomenon of segregation. So-called soluble impurities such as P and C appear to form a complex with S, this complex being insoluble in liquid steel. From these data the theory that segregation in steel ingots is due to differential solidification is discussed, and shown to be untenable. Evidence is given to show that the concentrated areas of impurities usually found in steel ingots are caused by the floating upwards of impurities while the steel is liquid. The theory of segregation advanced is that both liquid and solid inclusions which are insoluble in steel tend to rise to the surface of the ingot, due entirely to their low sp. gr. as compared with steel. WAT (12b)

Volume Changes of Cast Irons During Casting. E. J. Ash & C. M. Saeger, Jr. *Bureau of Standards Journal of Research,* Vol. 8, May 1932, pages 601-614.

The volume changes occurring in 8 types of cast Fe during cooling from the liquid state to room temperature are given. The irons varied in composition from gray Fe to white Fe. The coefficient of volume shrinkage in the liquid state for irons over the range of temperature studied was 0.011% per ° C. The volume change during solidification varied from an expansion of 1.65% in a gray Fe to a contraction of 5.85% in a low-C low-Si type of Fe. The linear contraction of the sand cast bars varied inversely with the Si and C content and also with the cross-sectional area. The lowest linear shrinkage value measured was 0.67% (1½" sq. bar) and the highest was 2.08% (¾" sq. bar). In both heating and cooling curves and in the sand-cast condition bars, a pronounced effect was observed at about 1070° C. possibly indicative of some transformation. An expansion was observed at this temperature during the freezing of all melts of cast Fe. This expansion, however, was not due to decomposition of cementite alone, for white Fe bars having no free graphite present showed this same phenomenon. This expansion may have been caused by the separation of dissolved gases during solidification as has been pointed out by previous investigators. See also *Metals & Alloys,* Vol. 3, May 1932, page MA 136. WAT (12b)

Centrifugally Cast Guns. (Nach dem Schleudergussverfahren hergestellte Geschützrohre.) *Die Röhrenindustrie,* Vol. 21, July 18, 1931, pages 173-174.

Reports on experiments carried out in the Watertown Arsenal with 0.35-0.38 C, 0.6-0.7 Mn, 0.3 Mo, 0.05 V steel which was used for the centrifugal casting of 75 and 150 mm. guns respectively. The casting process with emphasis on the precautions to be borne in mind is fully outlined and the advantages and deficiencies of this kind of manufacturing method are critically discussed. EF (12b)

Variations in Chemical Analyses of Steel Ingots. K. R. Binks. *Iron & Steel Industry & British Foundryman,* Vol. 5, Nov. 1931, pages 55-56.

2 types of segregations are noticeable in steel ingots, one in which the enriched portions of the last liquid to solidify are brought into the head or discard of the ingot, the other, occurring in the body of the ingot where the concentrations of the individual constituents may be greater or less than the mean. Rapid cooling retains the constituents *in situ* and the localized differences become small. Segregation is further influenced by mold design, speed of teeming and temperature of casting. CHL (12b)

Forging (12d)

Construction of Dies. G. A. Smart. *Heat Treating & Forging,* Vol. 18, Feb. 1932, pages 111-112.

Deals with dies for board hammers and steam-hammers. MS (12d)

Pressing of Magnesium Alloys. R. Barbanel. *Light Metals,* Feb. 1932, pages 40-47. (In Russian).

Mg alloy corresponding to Dow F type (4.0 Al, 0.3 Mn) was studied in regard to casting and pressing into tubes. Much improvement could be obtained in casting by separating the crucible in 2 compartments by a steel slide and keeping the larger compartment covered with liquid slag while the metal was poured from the smaller one with which it was connected at the bottom of the crucible. The best temperature for pressing was found to be 350°-370° C. Higher temperatures caused checking while lower required excessive pressure. (12d)

Makers of Forgings Effect Economies in Production. *Steel,* Vol. 90, Jan. 4, 1932, page 159.

Notable developments in the forging industry during 1931 include a new pressure method of forging to closer limits, an increase in the number of rotary-hearth furnaces, better temperature control, improvements in forging machinery leading to higher precision, and the wider use of higher speeds, automatic lubrication and mechanical handling in foundries. JN (12d)

New Application Possibilities of Hot Pressing Methods. (Neue Anwendungsmöglichkeiten des Warmpressverfahrens.) K. Springorum. *Deutsche Motorzeitschrift,* Vol. 9, Jan. 1932, pages 20-22.

Instead of cast Ni-alloys and hot pressed brass which is later Ni or Cr plated, the writer urges the use of the special Ni alloy Admiro (Admos, Allgemeine deutsche Metallwerke, Berlin) which is intended for hot pressing methods. The alloy is silver-white, corrosion resistant and takes a bright luster on polishing. The tensile strength is 60 kg./mm.^{2} and the elongation is 15%. Difficulties in making fittings, door knobs, window handles, etc., are overcome by drop forging over a steel core. The alloy is in use on several German liners. EF (12d)

Manufacture of Forged Shafts. R. V. Wallace. *Heat Treating & Forging,* Vol. 18, Feb. 1932, pages 95-97, 101.

In forging shafts, operator should insure against overheating or burning, preparatory to forging; work well in the plastic range to avoid the crystalline distortion and strain attendant on working at too low a temperature; and finish the metal at the critical range to obtain the maximum grain refinement possible. As close control over these and other important metallurgical elements is rather difficult, finished forging will generally require a special heat treatment in order to be made more dependable for service. This treatment consists of a preliminary normalizing at high temperature, about 300° F. above the critical range, followed by a second normalizing at normal temperatures. MS (12d)

Special Tool Steels for the Working of Non-Ferrous Metals. (Sonderstähle in Werkzeugen zur Verformung von Nichteisenmetallen.) V. Fabian. *Zeitschrift für Metallkunde,* Vol. 24, Feb. 1932, pages 40-42.

Materials for dies; behavior of alloy steels in deforming cold and hot metals; reasons for poor performance; hair-cracks and tension-cracks; influence of correct heat-treatment upon performance by elimination of hair and tension-cracks. RFM (12d)

Machining by Pressure. John H. Friedman. *S. A. E. Journal,* Vol. 30, Feb. 1932, pages 80-83.

A new type of forging press is described which works more accurately than the known machines. Finish forging on this machine can be done on the heat remaining from forging or annealing at a temperature below that at which scale is formed. Also cold coining can be done with it. The economy of this method is great as it eliminates roughing cuts, reduces the number of handlings and, in some cases, also any further machining. The machine is also used for straightening and sizing malleable castings and for hot-forging both ferrous and non-ferrous metals. A number of forged parts are illustrated. Ha (12d)

Compressed Air Reduces Forge Hammer Cost. F. A. Kolb & R. C. Grimstead. (Duquesne Light Co.) *Heat Treating & Forging,* Vol. 18, Mar. 1932, pages 171-173.

Woodings-Verona Tool Works, Verona, Pa. has two 4600 lb. and one 1500 lb. drop hammers and two 2000 lb. and two 1000 lb. forging hammers. These were formerly operated by steam supplied by two 300 hp. stoker-fired boilers. About a year ago steam was replaced by compressed air supplied at 100 lb. from a 2-stage 18" x 11" x 14" compressor driven by a 350 hp., 100% power factor, 3-phase, 2200 volt, 60 cycle synchronous motor. Compressor feeds directly into an air receiver 5 ft. in diameter and 12 ft. long. To adapt the hammers for air operation, the lap of the piston-valves was increased 1/16" on each end of the piston to prevent idling of the ram between operations, and the hammers were repacked. Experience with air operation shows that cost of operation has been reduced about 50%, dripping of hot water on the dies has been eliminated, packing expense has been reduced, and idling of the ram between operations has been eliminated. Describes method of analyzing savings to be expected by replacing steam with air, before the installation was made. MS (12d)

Shearing & Punching (12e)

New Type Shears with Speed Control. (Neue Fliegende Schere mit Geschwindigkeitsregelung.) Heinrich Flender. *Stahl und Eisen,* Vol. 52, Apr. 14, 1932, pages 371-372.

Diagrams showing speed-regulated shears as developed by Klein Bros. Machinery Co., Dahlbruch, are illustrative. Used for cutting hot billets up to 40x40 mm. and for rolling mill speeds from 2 to 4 m./sec. Operated by steam or compressed air. Change from one speed to another is made by changing time for end of exhaust and takes 1 min. for a rolling speed of 3.5 m./sec. Total time for one cutting stroke and one return stroke, 0.56 sec. Additional shears are manufactured for cutting other sizes of billets, mill bars, or rods. DTR (12e)

Extruding (12f)

The Extrusion of Metals. C. A. Colombel. *Rolling Mill Journal,* Vol. 5, May 1931, pages 355-358; June 1931, pages 419-422, 430-431.

Introductory article. The author describes 3 early experiments presented to the Imperial Institute of France by H. Tresca in 1864 on the flow of metals under pressure. These experiments tend to show: (1) that a lateral flow of metal occurs during extrusion together with an enveloping of the upper parts of the slug by thin envelopes of metal originating from the lower parts; (2) that the flow of metal from axis to circumference is greatest at the middle and least at the upper and lower surfaces of the extruded slug; and (3) that metals flow through orifices under pressure in the form of hollow jets, thereby resembling the flow of liquids. The second article continues with a description of early experiments and furnishes a discussion of the flow of metals through circular, triangular and quadrangular orifices, through 2 circular orifices simultaneously, and through lateral orifices of circular and square cross-sections. JN (12f)

Power Demand and the Flow Procedure in Extrusion Presses. (Kraftbedarf und Fliessvorgänge beim Stangenpressen.) *Zeitschrift für Metallkunde,* Vol. 24, Apr. 1932, pages 79-84.

A description of laboratory studies upon the cold extrusion of Sn and Pb, in which the flow of metal is followed by the displacement of reference lines in the original piece; including plant studies of the hot extrusion of brass (58% Cu, 2% Pb) in a 1000-ton press. The influence of piece length, die length, extrusion velocity, extrusion degree (ratio of cross-sectional area of original piece to that of extruded piece), and die form upon the processes of flow and the power demands has been studied. The structure and properties of extruded brass are described and illustrated. Concluded with a discussion of theoretical equations of flow. RFM (12f)

The Structural Changes during the Commercial Shaping Processes. (Die Formänderungen bei technischen Formgebungsverfahren.) E. Siebel. *Die Naturwissenschaften,* Vol. 19, June 5, 1931, pages 515-518.

The difficulties of numerically evaluating deformation processes are pointed out. Distortions are traced with respect to (a) deformations in a body consisting of planes perpendicular to each other and (b) to stretching plus an additional displacement. Drawing tests with soft annealed Cu-rods through various dies were performed. A coördinate system scratched onto the surface, disclosed a uniform stretching over the entire cross-section and additional distortions towards the edge. Extruded Pb showed the same phenomena, whereas cold-rolled material did not exhibit any distortions of the cross-section. The second part of the paper pertains to the courses of deformations in the deformed regions. The appearance of flow lines starts an appreciable distance from the die and comes to an end in the die itself. In the extrusion press an upsetting effect takes place at the outer parts of the extruded body. The flow lines on drawing, extruding and punching are shown in the illustrations. EF (12f)

Machining (12g)

New Method of Drilling Motor Cylinders. (Ein neuer Weg zur Bearbeitung von Zylinderbohrungen.) H. Iby. *Deutsche Motorzeitschrift,* Vol. 9, Jan. 1932, pages 16-18.

6 main requirements to be met, when making cylinders in motor blocks are summed up. The new "fine drilling method," which employs Widia (tungsten carbide metals) or diamonds, is characterized by high cutting speeds and small feeds. The usual drilling and finishing methods are critically discussed and the defects at the cylinder walls are shown in various micro-photographs made during an investigation in the Technische Hochschule Wien. A comparison was made with the new method, which worked cleaner, the higher the cutting speed and the lower the feed. EF (12g)

The Machinability of Steel in Dependence on the Heat Treatment as Tested by The Drilling Method According To Keep-Lorenz. (Beitrag zur Frage der Bearbeitbarkeit des schmiedbaren Eisens in Abhängigkeit von seiner Wärmebehandlung unter Verwendung des Bohrverfahrens nach Keep-Lorenz.) G. Gutberlet. Doctor's thesis, Technische Hochschule Dresden, 61 pages. Publisher: Formmhold & Wendler, Leipzig, 1931.

The machinability of 5 different steels was tested by the Keep drilling test. The structure of these steels had been varied (1) by annealing at increasing temperatures, (2) by hardening and tempering at increasing temperatures, (3) by spherodizing the Pearlite. After each of the above heat treatments the following properties were tested: Brinell hardness, tensile strength, yield point, elongation, reduction of area, notch toughness, grain size, machinability and resistance to machinability. The machinability was tested by the Keep method which takes the depth of drilling after 100 revolutions as indicative of the machinability. The resistance to machinability was determined by measuring the turning moment transmitted from the drill to the piece to be drilled. GN (12g)

Diamond and Widia. (Diamant und Widia.) F. K. Böck. *Maschinenkonstrukteur-Betriebstechnik,* Vol. 64, Nov. 10, 1931, pages 220-223.

A comparative study was made on the structure, properties, working loads, and price of Widia and diamond-tipped tools. MAB (12g)

An Old Die Sinker Chats. A. G. Trams. *Heat Treating & Forging,* Vol. 18, Jan. 1932, page 38.

Hints on the grinding and use of roughing cutters and on a device for determining the taper of bores. MS (12g)

Cutting Fluids and Their Applications. J. D. Roney & G. L. Summer. *American Machinist,* Vol. 76, Jan. 14, 1932, pages 50-53, 67.

When a single machine performs severel operations it is best to use a cutting fluid suitable for the most severe operation and not change fluids. Discusses water cutting fluids and lard oil combinations. The real information in the article is condensed in table form showing the cutting fluid used for various machinery operations on the cold rolled steel, axle steel, tool steel annealed, heat-treated bronze rod, cast bronze, cast steel, wrought iron, sheet iron, fiber, hard rubber, and micarta. RHP (12g)

Machinability of Cast Iron (Die Zerspanbarkeit des Gusseisens im Drehvorgang.) A. Wallichs & H. Dabringhaus. *Stahl und Eisen,* Vol. 51, Oct. 1, 1931, pages 1233-1234.

In order to test the machinability of cast iron turning experiments were carried out on 21 different types of cast iron. High speed steel tools were used and the turning speed was determined which was necessary to ruin the tool after a turning time of 60 minutes. Such "cutting time-speed" curves were established for all cast irons tested, and for various depths of cut. The results show that in doubling the feed there results double the decrease of the cutting speed as doubling of the depth of cut brings about. The results of the cutting tests were also plotted against the hardness of the cast irons used and it is shown that there is no linear dependence between machinability and hardness as is generally assumed. But a rather smooth curve can be drawn through the points marking the results. Though the fluctuations of the individual points are larger than in establishing the same relation for steel (A. Wallichs & H. Dabringhaus, *Maschinenbau,* Vol. 9, 1930, pages 257-262) it can be stated that the machinability of non-alloy cast iron is at least approximately related to its hardness. In plotting the results for various angles of the tool, speed, feed, depth of cut, hardness of the material to be machined, etc. in so-called "Nomograms" the best conditions of machining cast iron can easily be determined. GN (12g)

Ramet. L. Anastasiadis. *Zeitschrift für Metallkunde,* Vol. 24, Mar. 1932, page 66.

A short notice on the new cemented tanalum carbide tool material developed by Fansteel Products Company. RFM (12g)

Effect of Alumina on the Machining of Steel: Its Determination. (Influence de l'Alumine sur l'Usinage de l'Acier: Son Dosage.) R. Collee. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 455-457.

Difficulties encountered in boring steel because the tools dulled were found to be due to the pressure of Al_2O_3 in the steel, which is very hard. The method used for determining alumina in steel consists in dissolving the sample in strong mineral acids, fusing the insoluble residue with Na_2CO_3, taking up in HCl, filtering off SiO_2 and precipitating the Al_2O_3 in AcOH solution as phosphate after reducing any Fe present by means of $Na_2S_2O_3$. MAB (12g)

Rules for Tool Makers. (Leitsätze für Werkzeugmacher.) A. Gössler. *Die Werkzeugmaschine,* Vol. 36, Mar. 31, 1932, pages 103-105.

Practical hints are given to be observed in making tools. GN (12g)

Grinding Tools with Widia Metal. (Das Schleifen der Werkzeuge mit Widiaschneiden.) J. Alberts. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, Mar. 5, 1932, page 32.

Discusses briefly the use of Widia metal for machining, and its advantages. MAB (12g)

Cashing in on the New Alloys. *American Machinist,* Vol. 75, Nov. 12, 1931, pages 754-755.

Present tools are not suitable for tungsten carbide cutting speeds. The possibility of strengthening present designs and wholly new designs is discussed. RHP (12g)

Hard Metal in Industry. (Hartmetall im Betriebe.) *Das Werkzeug,* supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 7, Nov. 10, 1931, pages 217-219.

Compares the Brinell hardness and brittleness of high speed steel, Cr-Ni steel, Akrit, Widia metal, and quenched tungsten carbide. A comparison is also made on the depth to and rate with which Widia cuts cast Fe, steel and hard castings, SM steel, alloy (Mn and stainless) steels, Cu, Cu alloys, Al, and insulating and non-metallic materials such as hard paper fabric, bakelite, hard rubber, and glass. MAB (12g)

Longitudinal Turning Tools in Automatic Lathes. Radial and Tangential Steels. (Etwas über Langdrehwerkzeuge der automatischen Drehbänke. Radial- und Tangentialstähle.) H. Hilbert. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, Feb. 10, 1932, pages 17-18.

Describes the mechanics of machining and its testing. MAB (12g)

How to Make Carbide Tools Pay. J. M. Highducheck. *American Machinist,* Vol. 76, Jan. 7, 1932, pages 16-19.

Reviews methods of using tungsten carbide tools for grinding. Presents methods of keeping records of work done. RHP (12g)

Researches on the Cutting Force. II. Cutting Action of Planing Tool. Makato Okoshi. *Scientific Papers Institute Physical & Chemical Research,* Tokyo, Vol. 14, Oct. 20, 1930, pages 193-225. In English.

The cutting action of a simple planing tool was examined microscopically at different cutting speeds and depths of cut. The tools used had straight cutting edges, clearance and side rake angles of 5° and 0° respectively, and varying top rake angles. Preliminary tests with wax indicated that below a critical cutting speed the cut is of the crack type, and above this speed of the slip type. The critical cutting speed increases with the depth of cut, the rate of this increase being greater as the cutting angle decreases from 90°. With cast Fe, mild steel, and Al the same principles hold, and it is considered that the "flow type" of cutting described by Rosenhain and Sturney (*Engineering,* Jan. 30 and Feb. 6, 1925) is merely a variety of the slip type. With 60:40 brass, and Cu, the cutting action is always of the slip type, and no critical speed is observed. The change from one type to another is attributed to change of frictional resistance between the chip and top rake surface. In the case of brass the friction is very low. This is shown to result in the material being pulled upwards during the cut instead of being compressed downwards. This produces the "chattering" of the tool often met with in cutting brass. The direction of slip is shown to change with the cutting angle and material, in contradiction to the conclusion of Rosenhain (loc. cit.), J. T. Nicolson (*Engineer,* Apr. 14, 1902), Stanton (*Engineering,* Jan. 30, 1925), and Hankins (*Proceedings Institution Mechanical Engineers,* 1923), while Herrmann's equation (*Ingenieur und Maschinenmechanik,* Vol. 3, III, Abt. 1, page 825) does not agree with the present results. Ha (12g)

Drawing & Stamping (12h)

The Stresses in Wire Drawing. E. M. Horsburgh. *Transactions Institute Engineers & Shipbuilders, Scotland,* Vol. 74, 1931, pages 318-354.

In the discussion of this paper many interesting points were raised, including the properties of metal suitable for wire drawing; the properties which wire must possess in addition to tensile strength, such as flexibility, durability, and recuperability; and the influence of annealing and heat-treatment on the strength and hardness during drawing. There was also considerable discussion on the stresses occurring in the wire, the pressures exerted by the die, and on stress analysis as applied to elastic material, plastic material, and viscous fluids. The author attempts to find analytically the variation and distribution of the stresses in the die itself along its axial length during drawing. Ha (12h)

Experiments in Wire-Drawing; Behavior of a Composite Rod. W. E. Alkins & W. Cartwright. *Engineering,* Vol. 132, Sept. 25, 1931, pages 397, 423-424.

Includes discussion. Condensed from paper read before the Institute of Metals, Sept. 15, 1931. See *Metals & Alloys,* Vol. 2, Nov. 1931, page 272. LFM (12h)

The Drawing of Non-Ferrous Wires. E. L. Francis & F. C. Thompson. *Engineering,* Vol. 132, Nov. 13, 1931, pages 622-625.

Condensed from paper read before the Institute of Metals, Zurich, Sept. 15, 1931. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 314. LFM (12h)

Vital Variables in Steel Stampings. *Product Engineering,* Vol. 3, Apr. 1932, pages 141-144.

The economical production of pressed metal goods depends to a great extent on proper correlation of design, selection of material and manufacturing methods. This is illustrated by examples of electrical apparatus. Ha (12h)

Studies of the Wire-Drawing Process. II. Factors Involved in the Power Requirements. F. C. Thompson & E. L. Francis. *Carnegie Scholarship Memoirs, Iron & Steel Institute,* Vol. 20, 1931, pages 87-124.

11 references. The several factors of mechanical properties, speed of drawing, dimensions of the wire, percentage reduction, angle and contour of the die, temperature, coefficient of friction, and space-lattice of the metal are involved. These are discussed theoretically and mathematical relations deduced. The power required is proportional to tensile strength, rate of drawing, and final cross-section as dimensional factors times a function of the reduction without dimensions which will contain the elements of the other factors above mentioned. Material used in the experimental work varied in tensile strength from 2840 lbs./in.^{2} for Al to 38,800 lbs./in.^{2} for cold drawn Ni and all material except a mild steel of 25,600 lbs./in.^{2} tensile were of face-centered cubic lattice. The effect of low and high speed of drawing were made in connection with the study of the mechanical properties and speed of drawing in their influence on the power requirement. The power requirement is shown to be a linear function of the elastic limit in tension for the several non-ferrous materials. The mild steel falls well away from the curve showing the stresses required are materially altered with the lattice of the material. At very low rates the speed is somewhat affected but at higher speeds the rate of drawing can be increased over a wide range without affecting the tension required. The tension is shown to be closely proportional to the percentage reduction. The experimental results confirm the theoretical equation of the preface. WLC (12h)

Pickling (12i)

The Muriatic Acid Dip for Metal Ware Galvanizing. Wallace G. Imhoff. *American Metal Market,* Vol. 38, No. 178, Sept. 12, 1931, pages 5, 7, 9.

Muriatic acid dip in metal ware galvanizing is used to remove the corrosion between pickling and galvanizing operations, and also to counteract oxidizing effect that the H_2SO_4 pickle has on the work. This dip may be considered as a balance to counteract or overcome action of the pickle. Under practical conditions the stronger the H_2SO_4 solution and the higher the pickling temperature, the stronger the HCl dip must be to counteract it. Many kinds of Fe oxides and scales formed during the finishing process and also in the corrosion of steel surfaces later on. The writer gives examples of 15 different plants with their methods of pickling and dipping, strength of all reagents with details of all metal-ware pickling operations. Cites the acid and Fe content of HCl dip when good quality product is being produced:

	Acid content	Iron content
1.	11.30%	6.00%
2.	6.00%	5.00%
3.	5.50%	2.50%
4.	6.00%	4.50%
5.	7.50%	4.00%

DTR (12i)

Modernized Pickling Room Proves Investment. *Iron Age,* Vol. 128, Dec. 10, 1931, pages 1484-1486.

Description of the pickling room equipment of the Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y., for cleaning wire rods. The most noteworthy improvements are the tanks and their automatic control. VSP (12i)

Pickling for Plating. Clayton M. Hoff. *Brass World,* Vol. 27, June 1931, pages 129-131.

The purpose and chemistry of pickling for the preparation of Fe and steel sheets for plating, the acids used and characteristics of each, new developments and means of preventing acid brittleness are discussed. See *Metals & Alloys,* Vol. 3, May 1932, page MA 138. Ha (12i)

The Pickling of Iron and Its Alloys. *American Machinist,* Vol. 75, Dec. 10, 1931, pages 905-906.

Summarized review of pickling practice. Caustic soda or other cleaning treatment should be used before pickling to remove oil and grease. H_2SO_4 may be used in concentration of 2-15%. HCl from 10-50% has more rapid action but is expensive. The acid strength and temperature, pitting, acid brittleness, sheet blistering, inhibitors and the formation of iron salts are discussed. RHP (12i)

Cold Working (12j)

Influence of Cold Work upon Plasticity at High Temperatures. (Einfluss von Kaltreckung auf die Plastizität bei erhöhten Temperaturen.) E. Schmid & I. Wassermann. *Zeitschrift für Metallkunde,* Vol. 23, Aug. 1931, pages 242-243.

The plasticity of hard-drawn and annealed Cu wires (0.15 mm. diameter) was studied by taking curves of elongation under constant load as a function of time at temperatures between 200° and 450° C. Between 250° and 400° C. the hard-drawn wire elongated more rapidly than the annealed wire, presumably because of the greater lattice mobility accompanying the phenomena of crystalline recovery and recrystallization. At 450° C. the rate of flow in the 2 wires was found nearly equal, owing to the rapid recrystallization of the cold-drawn wire. At 200° C. the rate of flow of the cold-drawn wire was somewhat slower. RFM (12j)

Calculation of Internal Stresses in Cold-Drawn Tubes. (Berechnung der Restspannungen in kaltgezogenen Rohren.) N. Dawidenkow. *Zeitschrift für Metallkunde,* Vol. 24, Feb. 1932, pages 25-29.

Previously proposed methods for the quantitative determination of internal stresses are critically reviewed, and a new mathematical development of the necessary formulae is given. An experimental analysis of the stresses in a cold-drawn brass tube is made by the use of the formulae developed. RFM (12j)

Influence of Cold-Work on the Specific Heat. (Der Einfluss der Kaltbearbeitung auf die spezifische Wärme.) J. A. M. van Liempt. *Die Naturwissenschaften,* Vol. 19, Aug. 14, 1931, page 705.

Formula derived. EF (12j)

Further Experiments on the Magnetostriction of Cold Drawn Wire. J. S. Rankin. *Journal Royal Technical College* (Glasgow), Vol. 2, Jan. 1932, pages 587-589.

In a previous paper (above Journal, Vol. 2, 1931, page 385) it was shown that the magnetostriction of 7/32" diameter rod is decidedly different from that of the same iron reduced by cold-drawing to 1/16" diameter. Whereas the 1/16" cold drawn wire shows only a small expansion up to a field of about 40 c.g.s. units and thereafter for higher fields a contraction, the 7/32" material exhibits much bigger expansion and no contraction even at a field of about 160 c.g.s. units, the highest used. Tests were also carried out on ⅛" diameter wire supposed to have been cold drawn from the 7/32" diameter rod, but instead of obtaining a magnetostriction curve intermediate between the other two it was found that cold drawing from 7/32" diameter had increased the magnetostrictive expansion. It was, therefore, considered desirable to check this rather astonishing result, and the present research records results indicating conclusively the effect of successive draws on magnetostriction. Briefly, as the diameter is reduced in the successive stages of the drawing operation the effect on the magnetostriction is a continuous decrease. WAT (12j)

Cleaning (12k)

Degreasing and Cleaning of Metal Parts. (Die Entfettung und Reinigung von Metallteilen.) A. Burg. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 147-148.

The efficiency of the various chemical reagents used for degreasing and cleaning of metals is discussed. GN (12k)

Rust Resistance for Enameled Sheet Steel. F. P. Spruance. *American Machinist,* Vol. 76, Jan. 14, 1932, pages 48-49.

An abstract of an unpublished paper presented at the Society of Automotive Engineers, Production meeting, Detroit, Oct. 7-8, 1931. Enameled fenders were rusting due to alkaline salts from the rinse water. A form of phosphoric acid called "Deoxylyte" was used to neutralize the alkali. This does not remove oil so "Deoxidine," a phosphoric acid containing oil solvents, is used. To produce a surface to which enamel primers will adhere a process known as the "Bonderite" process is used. This is a treatment with a mixture of manganese dihydrogen phosphate and a very small amount of copper phosphate. This is followed by washing with water and enameling. RHP (12k)

The Denickeling Bath. (Das Entnickelungsbad.) *Oberflächentechnik,* Vol. 9, Apr. 19, 1932, page 80.

Material which has developed defects in the Ni plating process is usually later put in a bath to take off the Ni again and to prepare the goods for another plating process. This denickeling bath requires a certain care if the denickeled parts are to be in such condition that they are ready, after slight repolishing, for the Ni bath. Particular attention must be paid that the denickeling bath does not become oversaturated with Ni salts. The noxious H_2SO_4 fumes which the bath develops can safely be overcome by covering the bath with "Chromprotect." Similar precautions and treatments are discussed for baths for taking off deposits of Cd, Cr, Cu and brass, and Zn. Ha (12k)

Manufacturing of Cleaning Barrels for Castings. (Die Selbstanfertigung von Gussputztrommeln.) G. Krebs. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Feb. 21, 1932, pages 77-79.

The article discusses the procedure to be followed in making barrels for cleaning castings. Some objections to the cleaning of castings in barrels are refuted. GN (12k)

Polishing & Grinding (12l)

The First Research Station for the Grinding and Polishing Industry. (Die erste wissenschaftliche Zentralstelle der Schleif- und Polierindustrie.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Jan. 24, 1932, pages 48-49.

An illustrated description is given of the permanent exhibit of the newly established "Institut für Schleif- und Poliertechnik" at the Technische Hochschule of Braunschweig. GN (12l)

Special Grinding Machine for Eccentric Discs. (Sonderschleifmaschine für Nocken.) Weil. *Die Werkzeugmaschine,* Vol. 36, Feb. 15, 1932, pages 40-41.

A new machine for grinding eccentric discs as they are used in automobile construction is described. The new machine is built by J. E. Reinecker, A. G. Chemnitz, Germany. GN (12l)

Hardening by Grinding. George J. Murdock. *American Machinist,* Vol. 76, Jan. 7, 1932, page 7.

It is often difficult to harden press tools without distorting them. Sometimes they may be hardened by grinding with a filled carborundum wheel. A mixture of beeswax and lard oil are applied to the carborundum wheel for filler. RHP (12l)

The Application of Corundum to Grinding Discs. (Die Verwendung von Korund zur Herstellung von Schleifscheiben.) J. Dorfner. *Berichte der deutschen keramischen Gesellschaft,* Vol. 13, Feb. 1932, pages 86-88.

A general survey is given on composition, properties and application of corundum. GN (12l)

Protecting Surface of Polished Stainless Steel Sheets During Forming. C. C. Snyder. *Sheet Metal Worker,* Vol. 23, Mar. 18, 1932, page 134.

In order to avoid scratching and otherwise marring the polished surface in working sheet steels the dies should be highly polished; a lubricant of lithopone and linseed oil is recommended or the use of thin paper between die and polished metal. A film of iron which often forms by the contact with steel rollers, steel dies or shears and discolors the surface, should be removed with HNO_3 passivation treatment or proper buffing compounds. Ha (12l)

Modern Roll Grinding. N. Leerberg. *Rolling Mill Journal,* Vol. 5, May 1931, pages 323-326, 349-350.

For the successful grinding of roll necks and roll bodies, the roll drive must be positive in action and free of vibration. The roll supports must run dead true and carry the weight without heating. The grinding wheel must run at a speed giving the least vibration, must not wear too fast or glaze rapidly and must wear evenly and run without chatter. The spindle must be absolutely rigid and the cambering attachment must be rigid, frictionless and adjustable to any curvature. Several examples of proper grinding practice are described. JN (12l)

The Abrasive Wheel and Its Applications. W. R. Gutteridge. *Transactions Junior Institution of Engineers,* Vol. 41, Part IV, Jan. 1931, pages 164-179.

Under the heading of grinding there are 2 main branches, precision grinding and offhand or stock removal, which are in turn subdivided into about 30 smaller groups, principally differentiated by the type of machine in use. A third branch, hand grinding, is not dealt with in the paper. In precision grinding the chief factors to be taken into account are the class of wheel to be used, the surface speeds of the work and of the wheel, and the traverse of the wheel and the work. Cylindrical, universal and surface grinding machines are considered. A few safety suggestions and devices are mentioned. WHB (12l)

Polishing vs. Plating Standards. Ernest Lamoureux. *Metal Industry,* N. Y., Vol. 30, Apr. 1932, pages 153-154.

The proper polishing of the base metal before plating is essential for production of durable electrodeposits. PRK (12l)

Steel Mill Roll Finishing. H. J. Wills. *Abrasive Industry,* Vol. 12, Dec. 1931, pages 16-17.

The stresses set up at the grinding face by the wheel rotation and work pressures are close to ultimate impact resistance of the bond and grain structure. A slight increase in pressure will break or distort the grains and a decrease will cause dulling of crystals and glazing. The relation of wheel speed to work speed will determine shearing force. As wheel speed is increased in ratio to work speed, the stresses set up between work and wheel face are lessened, and the wheel is not broken down as rapidly as under lower wheel speeds. The degree to which wheel action is affected depends on the characteristics of the abrasive wheel used. Wheel and work speeds should be adjusted to compensate for the variation in stresses due to the reduction of the wheel diameter. (1) Rigid, nonvibrating machine elements permit the use of softer wheels which result in an increase in production. (2) Large diameter rolls permit softer bonds owing to the greater area of contact between wheel and work. (3) For chilled iron rolls, silicon carbide wheels are used for rough grinding and finishing; for hardened steel rolls, alumina wheels are used. (4) Finishing cuts may be improved with narrow wheels. To avoid changing wheels it is practical to dress the wheel face to the desired width. Dressing for rough cuts is done most economically with the conventional dresser. For finishing cuts a diamond is necessary. WAT (12l)

Polishing Stainless Steel Sheets. C. C. Snyder. *Sheet Metal Worker,* Vol. 23, Feb. 19, 1932, pages 80-94.

The types of polishing and buffing wheels and polishing and buffing materials are specified for use on "Enduro" stainless steel. Ha (12l)

Accurate Surface-Grinding of Castings. *Machinery,* Vol. 38, Oct. 1931, pages 122-123.

Description of the methods of accurately grinding large flat surfaces by the use of vertical surface grinders built by the Blanchard Machine Co., Cambridge, Mass. RHP (12l)

The Churchill Rod-Grinding Machine. *Iron & Coal Trades Review,* Vol. 124, Mar. 25, 1932, page 524.

The machine is designed for the rapid grinding of long bars of circular cross section to very fine limits with a maximum capacity of 1½" in diameter. An exact description is given of all the motions; the machine is driven by a 25 H.P. motor. Ha (12l)

Polishing of Aluminum Ware in Quantity (Polieren von Aluminiummassenwaren). *Die Giesserei,* Vol. 19, Apr. 29, 1932, page 169.

The articles are put into a rotating drum in which steel balls with a polishing agent rotate with the wares. A good polishing composition is:

3 parts of quartz or pumice stone
2 parts of vaseline
½ part of montan wax
1 part of iron oxide
5 parts of Vienna polishing chalk.

To get good surfaces the articles must previously have been pickled in NaOH or in a special Al pickling fluid. Ha (12l)

ECONOMICS (16)

Organization of Accounting Department in an Industrial Undertaking of the Borsigwerk, A.-G., O.-S. Mine and Smelter Works. (Organisation des Rechnungswesens in einen industriellen Unternehmen mit Hütten-und Zechenbetrieb, Borsigwerk, A.-G., O.-S.) ERNEST MEINERS. *Archiv für Eisenhüttenwesen,* Vol. 5, Apr. 1932, pages 537-542.

Report 56 of Committee on Economy of Operation Verein deutscher Eisenhüttenleute. Description of newly organized accounting department of Borsigwerk A.-G.-plant consisting of 2 mines producing 3,000,000 tons/yr., 1 coke plant producing 250,000 tons/yr. and 1 smelter producing 120,000 tons steel/yr., including steel foundry, sheet mill fabricating heavy, ordinary and high grade sheets, chain factory, gas welding plant, forging mill and mechanical laboratory. DTR (16)

Copper Industry in 1931—Advance Summary. H. M. MEYER. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 118, June 7, 1932, 5 pages.

Smelter output of Cu from domestic ores in 1931 (521,355 tons) decreased 25% from production in 1930 (48% in value), and refinery production from domestic and foreign sources (750,721 tons) declined 30%, the smallest outputs since 1922. Imports of unmanufactured Cu decreased 28% and exports of Cu 26%. Stocks of refined Cu increased 50%, and of blister Cu declined 23%. Figures are given for production by states and imports and exports by classes of product and country of origin or shipment. AHE (16)

Plant Book-Keeping and Cost Accounting in Iron and Steel Foundries. (Betriebsbuchhaltung und Kostenrechnung in der Eisen und Stahlgiesserei.) A. GEISSEL. Vol. 17 of Die Betriebspraxis in der Eisen-Stahl- und Metallgiesserei. Wilhelm Knapp, Halle (Saale), 1932. Paper, 6¼ x 9¼ inches, 136 pages. Price 11.50 RM.

The various factors in foundry costs are explained, suitable forms for recording these factors are shown, and methods of cost calculation from those data are given. H. W. Gillett (16)-B-

International Steel Conditions in 1931. E. T. GOOD. *Engineer,* Vol. 153, Jan. 1, 1932, pages 11-12.

In all countries the 1931 output of steel will, when all the figures are available, be probably 40% less than the 1929 output. France is operating more nearly normal than any other country. Compared with pre-war prices all construction materials are more expensive, except steel. Science and inventions will find it difficult to improve these other materials but improvements in steel are constantly being made. So it seems reasonable to assume that the steel trade will improve considerably when financial and political matters become normal. Production and import and export figures are given. LFM (16)

Sintering Economics. PERRY G. HARRISON (Evergreen Mining Co.). *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 480. Feb. 1932, 9 pages.

Gives estimated costs for sintering various iron ores and flue dusts in a Dwight-Lloyd. Cost for various localities as well. Concludes that Lake Superior ores carrying less than 15% moisture are sintered more economically at Lake front steel plants: over 15% moisture at mine, and never at interior furnace plants. The 2 reasons for sintering are to improve structure and to eliminate moisture and other volatiles. JLG (16)

Some Factors Concerning Silver Price. CORTLANDT W. HANDY. *Mining & Metallurgical Society of America, Bulletin* No. 223, Vol. 25, Jan. 1932, pages 19-37.

The question of rehabilitating Ag is treated not from the angle of obtaining or even fixing a higher price for Ag but with the point in view that whatever the price is it must be sustained by fundamental economic demand; a Au standard currency can do this just as well as bimetallism in the opinion of the author. The discussion on this point shows very wide disagreement. Ha (16)

Vanadium, Uranium and Radium in 1930. FRANK L. HESS. *Mineral Resources of the United States,* 1930, *United States Bureau of Mines,* Part 1, Dec. 14, 1931, pages 133-150.

In 1930, V production was practically confined to Peru, Northern Rhodesia, South West Africa, western Colorado and southeastern Utah. Production figures for the United States cannot be given. The Belgian Congo ores dominate the U-Ra market. An annoted bibliography of 61 references is given. AHE (16)

Cobalt, Molybdenum, Tantalum, Titanium, and Various Rare Metals in 1930. PAUL M. TYLER & ALICE V. PETAR. *Mineral Resources of the United States,* 1930, *United States Bureau of Mines,* Part 1, Jan. 14, 1932, pages 267-296.

No production of Co in the U. S. has been reported to the Bureau of Mines since 1921. Belgium is the principal source, furnishing 81% of the value of the Co and Co ore imported into the U. S. in 1930. (16 references). Domestic production of Mo ore in 1930 was 3,618 short tons of concentrates containing 6,205,000 lbs. (average 85.75%) of MoS_2, slightly less than 1929, but substantially greater than any previous year. There were no imports. The U. S. furnishes more than 85% of the world's supply of ore; the remainder comes chiefly from Norway with smaller shipments from Australia and Canada. (22 references). The production of Ta minerals in the U. S. in 1930 (S. D. & N. M.) was 5,100 lbs., compared with 22,117 lbs. in 1929 and 34,899 lbs. in 1928. Imports were 8,474 lbs. (15,250 lbs. in 1929). Uses are reviewed. Australia is the leading source of Ta ores. (35 references). The Ti industry made marked progress in 1930. Domestic production is confidential. (62 references). AHE (16)

Gold, Silver, and Copper in Wyoming in 1929. CHAS. W. HENDERSON. *Mineral Resources of the United States,* 1929, *United States Bureau of Mines,* Part 1, 1931, pages 271-273.

In 1929 Wyoming produced $1,766 worth of Au, Ag and Cu ($1,083 in 1928). 4 references. AHE (16)

Review of the Silver Market for 1931. *American Metal Market,* Vol. 39, Jan. 6, 1932, page 3; Jan. 7, 1932, pages 3, 7 and 10.

Economic discussion of production and sales, especially buying by India and China. As to the future of Ag, the writers have strong faith that its present plight will be corrected when international finances are adjusted and improvement occurs in world trade and prices. DTR (16)

Taking the Pressure out of Depression. CHARLES W. HARDY. *Metal Industry,* N. Y., Vol. 30, Apr. 1932, pages 155-156.

Advice is given on how to reduce overhead and other costs. PRK (16)

1 **The Present Status of the Mining and Iron Industry in Brazil. (Der gegenwärtige Stand des Berg- und Hüttenwesens in Brasilien.)** F. W. FREISE. *Berg- und Hüttenmännisches Jahrbuch,* Vol. 80, Mar. 15, 1932, pages 1-7.

The article gives a survey on the Brazilian deposits of Au, Mn ore, coal, other ores, as bauxite, Ni ores, chromite, and precious stones. The iron industry is still rather undeveloped. Production statistics are included. 12 references. GN (16)

Scientific Rate Setting in Foundries. T. M. HARRISON. *Transactions & Bulletin, American Foundrymen's Association,* Vol. 3, Jan. 1932, pages 650-660.

2 Rate setting as applied to mold and core-making operations is illustrated and described. CHL (16)

Let Us Check Our Readiness for Starting Aluminum Combines. N. S. HARITONENKOV. *Light Metals,* Feb. 1932, pages 1-4. (In Russian.)

Since the responsible men in the Al industry were criminally persecuted for stating that Al cannot be commercially obtained from low grades bauxites, nephelines, clays, etc. the industry began to develop rapidly. It is at the present behind any other branch of metallurgy in USSR. 2 of the plants which were to operate in 1932 with the production of 26,000 tons of Al per annum are not even built as yet.

3 Absolute lack of organization is responsible for this. (16)

Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1931—Advance Summary. J. P. DUNLOP. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 116, May 27, 1932, 1 page.

10 placers and 17 lode mines in the Eastern states in 1931 produced Au $23,827; Ag $18,545, 63,949 oz.; Cu $2,124,486, 23,346,000 lbs.; Pb $590,076, 7,974 tons; and Zn $15,422,112, 156,697 tons; decreases in quantity and value for all. AHE (16)

4 **Comparative Time Studies in Sheet Rolling Mills for Determining Costs. (Vergleichende Zeitstudien in Feinblechwalzwerken zur Ermittlung von Sortenkosten.)** HERMANN JORDAN. *Stahl und Eisen,* Vol. 52, May 12, 1932, pages 461-465.

Report 57 of Committee on Economy of Operation of Verein deutscher Eisenhüttenleute. Studies for comparing costs of 9 German sheet finishing mills. DTR (16)

Automobiles Lead in Alloy Steel Use. J. D. KNOX. *Steel,* Vol. 90, Jan. 4, 1932, pages 134-135.

In 1931, the automotive industry continued to lead in the consumption of alloy steels, with the machine tool industry and the agricultural industry coming second and third, respectively, while the railroads advanced from fifth

5 to fourth place. There was a sudden increase in the use of cold-drawn alloy steel bars during 1931 and an increase in the consumption of corrosion-resistant alloy steels, new uses for the latter being found in dairy machinery and in turbine construction. The development of low alloy steels containing Cr, Mn and Si during the year promises to be of industrial importance. JN (16)

The Metaline Lead-Zinc District. LEWIS P. LARSEN. *Advance Paper, American Zinc Institute,* Apr. 1932, 6 pages.

A review of the geological and metallurgical conditions of the Metaline district in the state of Washington near

6 the Canadian border. The ores average about 9.2% Zn and 2% Pb and produced in 1931 11 million lbs. of Zn and 2¼ million lbs. of Pb. Comparative figures of production cost are given with other places of production. Ha (16)

The Engineering Outlook. I. Economic Retrospect and Prospects for 1932. *Engineering,* Vol. 133, Jan. 1, 1932, pages 17-18.

Monthly iron and steel consumption figures are given for the years 1924 to 1931 inclusive. Production index figures are given for the same years using 1924 as the base figure. LFM (16)

Aluminum Production in Russia (La fabrication de l'aluminium en Russie). *Journal du Four Electrique,* Vol. 41, May 1932,

7 page 168.

The Volkoff aluminum plant with the theoretical yearly capacity of 5000 tons is now ready to operate but with imported raw materials. A larger plant now in construction expect to use a new process of alumina manufacture developed by Kouznetzoff and Joukowsky by substituting in a Norwegian process of Pedersen lime with barium carbonate. The mix is melted in an electric furnace, with carbon and iron scrap additions, ferro silicon eliminated magnetically and the barium aluminate leached. It is regenerated with soda. JDG (16)

8 **A List of Electric Steel Plants in Germany. (Liste des aciéries électriques en Allemagne).** *Journal du Four Electrique,* Vol. 41, May 1932, pages 168-169.

A list of plants in Germany which have electric furnaces with their number and capacity. JDG (16)

Statistical Compilations on Lead, Copper, Zinc, Tin and Aluminum. *Metallgesellschaft,* Apr. 1932, pages 42-52.

Detailed data on world production, prices and foreign trade in the metals named for the years 1928-1931 are compiled. Ha (16)

Recent Developments in Electrolytic Zinc. ARTHUR ZENTNER. *Advance Paper, American Zinc Institute,* Apr. 1932, 8 pages.

9 A review of the total Zn production of the world since 1920; the percentage of electrolytic production of the total increased from 10.50% to 27.31% in the U.S.A. and from 7.91 to 32.74% for the world during this time. Ha (16)

Metal Price Fluctuations. *American Metal Market,* Vol. 39, Jan. 5, 1932, page 3.

Monthly averages for past 7 yrs. plotted on a percentage basis with averages for 10 yrs., 1904 to 1913, representing normal pre-war values are given for Sn, electrolytic Cu, Pb, Zn, Sb, Al and pig iron. DTR (16)

10 **Roumanian Fuel and Iron Resources.** *Engineering,* Vol. 133, Apr. 15, 1932, pages 467-468.

Brief article stating that Roumanian Fe ores are being conserved by restricting production awaiting further prospecting. Home production meets the requirements in iron and 80% of the requirements in steel. Steel production is steadily increasing. LFM (16)

Consumption of Silver in the Arts and Industries of the United States. CHARLES WHITE MERRILL and the staff of the Common Metals Division. *United States Bureau of Mines Economic Paper* 14, 1932, 18 pages.

The consumption of Ag has increased very slowly; the quantity of new Ag used was only 18% greater in 1929 than in 1911 (Pb and Zn doubled over this period). Consumption of Ag by industries making products for ultimate consumption in 1928 and 1929 was 25,826,554 and 28,601,311 fine ozs., respectively. The division of these amounts among the industries in 1928 and 1929 was, respectively: Sterling Ag 36.4%, 34.4%; photography 25.4%, 26.6%; electroplating 14.9%, 14.4%; jewelry, optical goods and novelties 8.6%, 9.0%; industrials, including Ag solder 6.6%, 6.9%; chemicals 6.0%, 6.2%; dental supplies 1.9%, 2.1%, miscellaneous 0.0%, 0.3%; losses 0.2%, 0.1%. AHE(16)

Lead Industry in 1931—Advance Summary. H. M. MEYER. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 119, June 8, 1932, 3 pages.

Output of refined primary Pb from domestic ores in the U. S. in 1931 amounted to 390,260 short tons valued at $28,879,000, a decline of 32% in quantity and 50% in value from 1930. Production of refined Pb from foreign ore (chiefly Newfoundland, Mexico and Canada) decreased 24% to 52,504 short tons. About 38% of domestic production was from Mo., 26% from Id., and 19% from Utah, compared with 35, 23 and 21% in 1930. Antimonial Pb produced at primary smelters totaled 21,842 tons, containing 3,575 tons of primary domestic Pb, 1,568 tons of primary foreign Pb, 768 tons of primary domestic Sb, 196 tons of primary foreign Sb, 14,173 tons of secondary Pb and 1,474 tons of secondary Sb. AHE (16)

Zinc in 1930. ELMER W. PEHRSON. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, Part I, Apr. 25, 1932, pages 431-477.

The production of primary Zn in the U. S. amounted to 498,045 tons in 1930, a decrease of 20% from 1929, the lowest output since 1922. Of the total, 98% was produced from domestic ores and 2% from foreign ores, the former decreasing 20% and the latter 35%. Electrolytic Zn amounted to 26.3% of the total primary output, 25% in 1929. The apparent deliveries of primary Zn to domestic consumers decreased 28% and the industrial use of primary and secondary slab Zn declined 24%. World smelter production (1,524,000 short tons) decreased 5% in 1930. The largest tonnage decreases occurring in the U. S., Belgium and Great Britain, Canada, Norway, Northern Rhodesia, Poland and Mexico showed substantial tonnage increases. AHE (16)

The Point System for Determining Molding Piece Rates. W. J. MACNEILL. *Transactions & Bulletin, American Foundrymen's Association,* Vol. 3, 1932, pages 645-647.

A method is given by which the molding costs may be estimated quickly. CHL (16)

Replacement of Obsolete Materials is Dictated by Economy. H. E. MACK. *Steel,* Vol. 90, Jan. 18, 1932, pages 23-25.

A plea for the discarding of many obsolete materials and out-of-date specifications by machinery manufacturers in favor of a smaller number of standard steels and nonferrous metals of more recent development. JN (16)

Mercury Industry in 1931—Advance Summary. H. M. MEYER. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 103, Apr. 8, 1932, 2 pages.

Domestic production of Hg in 1931 increased 15% in quantity to 24,750 flasks, and decreased 13% in value to $2,162,000. Stocks increased during the year. Production was suspended at most mines at the end of the year. California produced 54% of the country's total (16% increase over 1930), Oregon increased production 71% to rank second, Nevada's production declined 33%, production in Texas was considerably higher and Arkansas produced Hg for the first time. Imports were only 356 flasks, as compared with 2,943 in 1930 and 14,292 in 1929. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Montana in 1930. T. H. MILLER. *Mineral Resources of the United States,* 1930, Part I, Feb. 24, 1932, pages 385-429.

The output of Au, Ag, Cu, Pb and Zn from Montana mines in 1930 was valued at $32,720,416, a decrease of more than 54% from 1929, of 35% from the yearly average for the decade 1921-30, and was less than any other year except 1921 since records began in 1904. Mont. ranked 2nd in Cu production, 3rd in Ag, 8th in Zn. Au output $(899,001) declined more than 20% from 1929 and 36.7% below the average for the past 10 years; it was the lowest output since records were started in 1904. Ag production (7,052,899 ozs., $2,715,362) decreased nearly 60% in value and 45% in quantity, was 38% less than the yearly average for the decade, and except for 1921 was the lowest production since 1904. Cu output decreased 34% in quantity and 51% in value to 196,187,523 lbs. worth $25,504,378. This was 10% less than the average output since 1921 and was the lowest since 1922. Pb production (21,306,044 lbs.) decreased 46% from 1929 and about 56% in value to $1,065,302. Zinc output was 52,841,108 lbs. valued at $2,536,373, decrease of 61% in quantity and 72% in value from 1929. This is 56% less than the decade average and the lowest output since 1921. AHE(16)

Lead in 1930. ELMER W. PEHRSON. *Mineral Resources of the United States, United States Bureau of Mines,* 1930, Part I, May 3, 1932, pages 479-514.

Total production of pig Pb in the U. S. in 1930 decreased 15% to 772,033 short tons. Production from domestic ores and base bullion decreased 15% to 563,740 tons, and from foreign ores and base bullion 32% to 69,293 tons, a total reduction of 17% in refined primary Pb to 643,033 tons, less than any year since 1923, and having a value 34% less than in 1929. The total Pb from foreign materials was 11% of the total in 1930, 13% in 1929. Production of pig Pb from secondary materials decreased 7% to 129.000 tons. About an equal amount was recovered in alloys. World smelter production was 1,830,000 tons, divided as follows: U. S. 33, Mexico 13, Australia 10, Canada 8, Spain 7, all others 29, the U. S. decreased from 36% in 1929 and Spain from 8%; "all others" increased 4%, the balance were the same. Production by states, districts and countries is discussed. Figures on consumption by uses are given. AHE (16)

PLANTS & LABORATORIES (17)

Steel Pressings for Automobiles. *Iron & Coal Trades Review,* Vol. 124, Apr. 1, 1932, pages 549-550.

The plant of the Pressed Steel Co., England, for the production of automobile bodies is described in detail. Ha (17)

1 **New Billet and Rod Mills at Donora.** *Iron Age,* Vol. 128, Nov. 5, 1931, pages 1182-1183.

Description of the improvements and additions made to the Donora plant of the American Steel & Wire Co. VSP (17)

Foundry is Located on the Top Floor of the Building. *Foundry,* Vol. 59, Nov. 15, 1931, pages 22-25, 44.

Describes the plant of the Rockford Brass Works which produces plumbing fittings, brass and bronze castings of various types. Light and ventilation are feature arrangements. Advantages outweigh disadvantages. VSP (17)

2 **Research Laboratories of the English Steel Corporation, Limited, Sheffield.** *Engineering,* Vol. 132, Nov. 27, 1931, pages 683-684.

Illustrated, brief article describing laboratories equipped for chemical analysis, works observation, metallography, and research. LFM (17)

The Metallurgical Laboratories of Steel Co. of Canada. *Canadian Chemistry & Metallurgy,* Vol. 16, May 1932, pages 142-143, 146.

An illustrated description. WHB (17)

The Layout of the Pretoria Steel Works Plant. H. J. VAN DER BIJL. *South African Mining & Engineering Journal,* Vol. 42, Part II, Dec. 19, 1931, pages 397-400.

3 The plant of the South African Iron & Steel Industrial Corporation, Ltd., is described. AHE (17)

Sand Spun Pipes. J. B. ALLAN. *Metallurgia,* Vol. 6, May 1932, pages 23-25, 32; *Foundry Trade Journal,* Vol. 46, May 19, 1932, pages 303-304, 309.

Describes an installation for the production of centrifugally cast pipes in sand molds. The method was developed by the Sand Spun Corporation of America, and the plant described has been installed at the Staveley Co. in England. OWE + JLG (17)

4 **A Modern Foundry for Light Castings. The Works of John Harper & Co., Ltd., Willenhall.** *Iron & Steel Industry,* Vol. 5, Oct. 1931, pages 9-11.

A description of an efficient lay-out. CHL (17)

Wide Flange Beam Mill of South Chicago Works. *Iron & Coal Trades Review,* Vol. 124, Apr. 22, 1932, pages 675-676.

The modern plant of the Gary works of 40,000 tons monthly capacity with seven 150-ton stationary open-hearth furnaces is described and illustrated; wide-flanged structural shapes from 8 to 36" in depth, with flanges from 6" to 15" and weighing from 21 to 425 lbs./ft. are produced. The mill consists of a 54" reversing blooming mill, a 52"
5 intermediate reversing stand and a 52" one-pass finishing stand. The auxiliaries and mode of operation are described. Ha (17)

Tool Steel Gear & Pinion Company. J. B. NEALEY. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 53-55.

Description of the plant at Cincinnati, Ohio, with special reference to the furnace equipment. Greater part of work is made from low-C steel, containing about 0.20% C. Developed a special method of carburizing. There are about 16 large gas-fired furnaces, many of which are of the car-bottom type. These are used for carburizing and other heat treating operations. MS (17)

6 **The Laboratories of the German Aluminum Producing Industries. (Die Laboratorien der deutschen Aluminium erzeugenden Industrie.)** H. ROEHRIG. *Aluminium,* Vol. 14, Jan. 15, 1932, pages 1-6.

Brief description and illustrations of the interior of laboratories of the Erftwerk and Lautawerk. See also *Metals & Alloys,* Vol. 3, May 1932, page MA 142. Ha (17)

A California Quicksilver Plant. G. J. YOUNG. *Engineering & Mining Journal,* Vol. 133, May 1932, pages 279.-280.

A brief description of the mechanically-operated Nichols-Herreshoff furnace installation by the Bumsted Mining Co.
7 near Middletown, Calif. WHB (17)

The Electric Furnace Installation of the Ford Factory in Koeln-Niehl. (Die Elektroofenanlage der Ford-Fabrik in Köln-Niehl.) E. SCHMIDT. *Elektrowärme,* Vol. 2, Apr. 1932, pages 91-95.

9 furnaces with a total of 1410 kw. for annealing, hardening and drawing are installed. The installation for continuous operation is fully described and illustrated. Ha (17)

The Northwest Lead Co. J. W. GWINN (Bunker Hill & Sullivan Mining and Concentration Co.). *Mining Congress Journal,* Vol. 17, Nov. 1931, pages 628-629.

8 Description of this plant is given in detail for manufacturing of pure Pb products, antimonial pipe and white Pb and Pb specialties. No solders, babbitts or mixed metals are produced. Raw materials are Bunker Hill 99.99% pig Pb, Wah Chang Circle Brand Sb and small amount of pure Cu for special sheet and pipe alloy specifications. 3500 to 4500 tons of Pb are manufactured per annum. There is a sheet Pb department for pure chemical sheet Pb and one for antimonial sheet Pb. Pure sheet Pb is furnished in sizes from 1 lb. to 60 lbs./ft.^{2}, and from 8 to 9 ft. wide and up to 55 ft. long. Antimonial sheets are supplied in Sb percentages from 1 to 10%, and in sizes specified by a customer. The
9 Pb pipe department operates chiefly with Northwest Lead Co.'s patented equipment. The press equipment produces over 225 pipe sizes, each ranging from seamless tubing to 12" inside diameter, with ¾" wall material. In addition, there is produced light wire, strip Pb, plumbing fittings, Bunker Hill brand lead wool, special equipment for pulp and paper mills, chemical plants, smelters and reduction works. DTR (17)

Malleable Castings. J. B. NEALEY. *Heat Treating & Forging,* Vol. 17, Nov. 1931, pages 1062-1064.

Description of the plant of Stockham Pipe & Fittings
10 Company, Birmingham, Ala. Recent innovation in pouring of castings is a motor-operated platform on which the operator stands, running parallel to the flask conveyor and a ladle trolley parallel to both. Core-ovens, malleablizing furnaces, furnaces for heat treating steel castings and galvanizing kettles are fired by gas. Malleable castings are packed in alloy steel boxes. MS (17)

MISCELLANEOUS (20)

Influence of High-Frequency Oscillations on Metallurgical Products. (L'Influence des Oscillations à haute fréquence sur les Traitements des Produits Metallurgiques.) G. Mahoux, with comments by L. Guillet. *Genie Civil,* Vol. 98, Jan. 1931, pages 41-42.

Magnetic susceptibility is greatly increased if the pieces under treatment are subjected to electromagnetic oscillations of high frequency. The tests so far made indicate great practical possibilities and are to be continued. Nitration is hastened and Ni deposits on the surface of steel are absorbed at 450° C. Ha (20)

The Calculation of Aeroplane Stringers for Stiffness. (Zur Berechnung auf Knickbiegung beanspruchter Flugzeughohne.) Alfred Teichmann. *Luftfahrtforschung,* Vol. 9, Dec. 1931, pages 85-134.

The investigation is an analytical treatment and development of a method to calculate beams and stringers of aeroplane considering some factors which hitherto have been neglected; for instance the reinforcing effect of ribs between the stringers is taken into account and also the multiple support of one through-going beam if the supports are not all in one line. To facilitate the evaluation of the developed formula tables with numerical values are given. Ha (20)

New Experiences with Electric Gas Purification Plants. (Neuere Erfahrungen mit elektrischen Gasreinigungsanlagen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Mar. 20, 1932, page 162.

Brief discussion of experiences on electric gas purification plants working according the Cottrell method. GN (20)

Progress Report of Pipe Joint Research. K. R. Knapp. *American Gas Journal,* Vol. 136, Apr. 1932, pages 39-43.

Design factors for successful performance of leak clamps are outlined along with the proper preparation of a joint about to receive such a clamp. Recommendations are made as to proper and improper types of joints under specific conditions. Test methods used in the research are explained in detail. Future activities include the study of cast iron bell and spigot joints and a detailed study of arc welding. CBJ (20)

The Action of Fusible Reaction Products or Pre-formed Eutecties on the Amounts of Conversion in Reactions of Powder Mixtures. (Ueber die Einwirkung von schmelzbaren Reaktionsprodukten oder vorausgebildeten Eutektika auf die Umsetzungsbeträge bei Reaktionen in Pulvergemischen). J. Arvid Hedvall & Ingemar Bergstrand. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 205, Apr. 20, 1932, pages 251-256.

The influence of ions and other admixtures in the conversions on the conversions in the solid state was investigated with special reference to eventual eutectics by using halides. It was found that for instance, CaO and BaO react already at fairly low temperatures with $PbCl_2$. If larger amounts of a melt are formed the conversion is considerably greater than if only solid materials reacted. If the amount of melt becomes so large that the conversion is increased the action is greater if a eutectic has been formed previously than if the components are joined after the beginning of the reaction. Small amounts of a melt as they are represented by certain impurities have no appreciable influence on the course of the reaction. Ha (20)

Investigation of the Method of Determining the Relation of Statical Hysteresis and Flexural Stress by Measurement of the Decrement of a Freely Vibrating U Bar. G. H. Keulegan. *Bureau of Standards Journal of Research,* Vol. 8, May 1932, pages 635-656.

To determine whether measurements of the decrement of a vibrating U bar could be used to measure with sufficient accuracy the statical hysteresis of a given material, the statical hysteresis of a U bar of Armco iron was first measured under cyclic static loading, and then the decrement of the vibrations of the same material was measured. The results of the experiment showed that within the limits of the accuracy of the approximate theory used, both methods gave equivalent results. For stresses above a certain small threshold value, it was found that in Armco iron the energy lost by statical hysteresis varied approximately as the cube of the amplitude of the maximum stress. WAT (20)

Silicon Carbide and Electro-Corundum. (Siliziumkarbid und Elektrokorund.) R. Schneidler. *Tonindustriezeitung,* Vol. 56, Jan. 25, 1932, pages 105-107.

The article outlines the theoretical principles of the production of silicon carbide, discusses the practical manufacturing and its application as grinding material and refractory. Along the same line, properties, production, and application of corundum are discussed. 1 reference. GN (20)

The Foundry Apprentice. C. Sherriff. *Foundry Trade Journal,* Vol. 46, Apr. 14, 1932, page 236.

Suggestions are made as to the grading of boys into 3 groups after a probationary period in the foundry—*Grade A:* Boys keen, interested, and capable of general foundry work; *Grade B:* Boys capable and satisfied to do molding only; *Grade C:* Boys who dislike the smell, dirt, and general conditions of a foundry, and who should be immediately dismissed. OWE (20)

On the Plastic Behavior of Metals. (Über das bildsame Verhalten von Metallen.) W. Prager. *Naturwissenschaften,* Vol. 19, Aug. 7, 1931, pages 681-685.

The theoretical treatise takes the following steps: Introduction, conditions of flow, correlation of stresses to deformations and the statically defined problems of the plasticity theory. EF (20)

Suspension Bridge Stresses Determined by Model. George E. Beggs. Elmer K. Timby & Blair Birdsall. *Engineering News-Record,* Vol. 108, June 9, 1932, pages 828-832.

Application of model study to the Mt. Hope bridge in Rhode Island gave results so close to analytical design values that model analysis was adopted for preliminary and check design of the Trans-Bay bridge at San Francisco. Live-load and temperature stresses and deflections are solved mechanically by means of a steel model. Principles of model design, construction and analysis are explained in detail. CBJ (20)

Prevention of Smoke in Metallurgical Operations. C. H. Desch. *Iron & Steel of Canada,* Vol. 15, Apr. 1932, pages 37-38, 47.

Paper presented to the 3rd International Conference on Bituminous Coal. See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 49. OWE (20)

Revamping a 28-year-old Steel-Truss Bridge. James P. Exum. *Engineering News-Record,* Vol. 108, May 26, 1932, pages 757-758.

Viaduct in Kansas City was damaged by fire, corroded from locomotive gases and worn by long service. Replacement of a wood floor by steel and concrete on spans over railroad tracks, reinforcement of eyebars by welding, and general repairs put the structure in condition for many more years of useful service. CBJ (20)

Influence of a Discovery Relating to the Production of Electrical Energy on the Evolution of the Chemical and Metallurgical Industries. (De l'Influence d'une Découverte dans la Production de l'Énergie Électrique sur l'Évolution des Industries Chimiques et Métallurgiques.) Henry Gall. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 92-95.

The paper is an address presented by the President of Société de Chimie industrielle. It outlines briefly the great and rapid progress made in the electrochemical industries, such as followed from the use of electrolysis in solutions, of fused salts and of the electric furnace, as a result of the invention of the dynamo by Gramme. MAB (20)

Explosive Disintegration of Acetylene in High-Pressure Producers. (Decomposition Explosive de l'Acetylene dans les Generateurs á haute Pression.) M. Fassbinder. *L'Usine,* Vol. 41, Feb. 5, 1932, page 31.

Although, according to the theory of Berthelot, the danger of the formation of highly explosive mixtures of acetylene under high pressure is always present yet the practical conditions, as for instance the dilution with inert gases preclude almost entirely all danger of explosion at the usual temperature of the surroundings. A very slight addition of illuminating gas reduces the risk very considerably. Several experiments made in this respect are briefly described. Ha (20)

On The So-Called Elden Meteorite. Robert E. S. Heineman. *American Journal of Science,* Vol. 23, May 1932, pages 417-420.

A unique object of suspected meteoric origin was found in 1927 near Flagstaff, Arizona. The mass consists of a graphite matrix veined with irregular intersecting bands composed of grains of metallic Ni-Fe. The results of a chemical analysis are: Metallic Fe 37.440, Fe as $FeCl_3$ 0.680, Fe as FeO 3.287, S 0.073, Si 0.432, Mn 0.120, Cl as $FeCl_3$ 1.300, P 1.110, Ni 4.040, Co 0.047, C as graphite 46.530, combined C 2.202, O as FeO 0.943, insoluble, mainly FeO and SiO_2 1.796. Flagstaff is about 35 miles in an air line from the Meteor Crater and is supposedly in the direction from which the meteor came. The specimen described could have been an outrider of the main swarm. WAT (20)

Steelmakers Strive for Low-Cost, High-Quality Ingots. *Steel,* Vol. 90, Jan. 4, 1932, pages 157-170.

The past year has witnessed an increase in the number of waste heat boiler installations. These boilers effect a recovery of about 23% of the heat input to the furnace. The use of automatic combustion control equipment has increased steadily, there being now over 50 open-hearth furnaces supplied with such equipment. The use of natural gas as an industrial fuel promises to be extended in the future. The manufacture of silica brick for open-hearth roofs has been greatly improved and the use of chrome brick refractories and high alumina brick has increased considerably during the year. JN (20)

The Development of the Scientific Heat Principles of Steam Boiler Construction. (Die Entwicklung der wärmewissenschaftlichen Grundlagen des Dampfkesselbaus.) H. Bonin. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Feb. 1932, pages 57-62.

The properties of steam, pressure and temperature in the saturated state, the total heat, specific volumes, critical pressure and temperature, specific heats, heat transition, and gas radiation are determined. The accuracy attained, the manner in which the tests were carried out, the fuel and combustion processes, the specific heats of waste gases, and the measurement of the temperature are discussed. MAB (20)

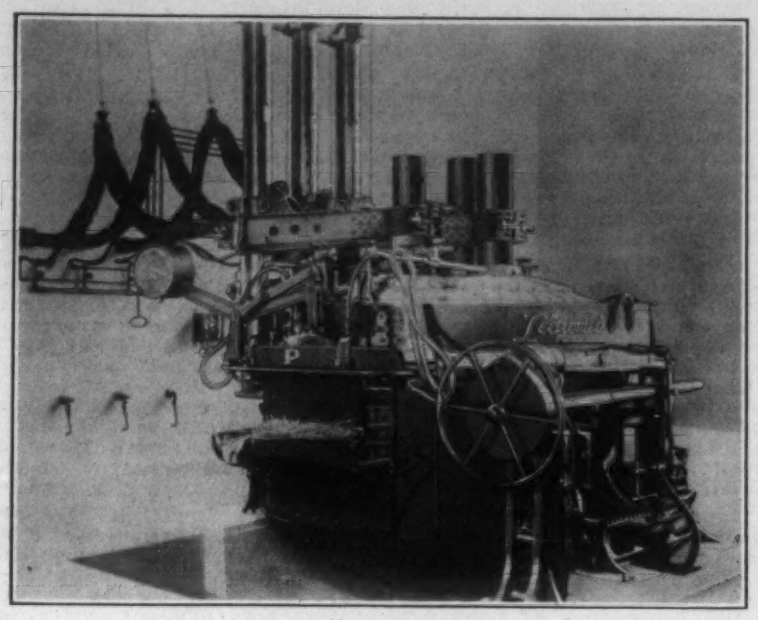
Standards Yearbook, 1932. For sale by Superintendent of Documents, Washington, D. C. Cloth, 6¼ x 8¼ inches, 394 pages. Price $1.00.

This volume starts with a symposium on standardization in communication. The activities of some 20 international standardizing agencies are then discussed, and the work of national standardizing laboratories in the United States, England, Germany, France, Canada and Japan is briefly outlined. National Industrial Standardizing bodies of 21 countries are mentioned.

The work of Federal Standardizing Agencies is discussed, special attention being given to that of the Bureau of Standards. A list of new Federal Specifications is given, and addresses of State Purchasing Agencies are included. The work of the American Standards Association, American Society for Testing Materials, American Marine Standards Committee and the Central Committee of Lumber Standards is described. Names, addresses of officers, and an outline of the activities of 416 trade associations, scientific and technical societies and other agencies concerned in joint action on standardization and allied matters are given. This is rather all inclusive, the Amateur Athletic Union of the United States, National Collegiate Athletic Association, the Intercollegiate Association of Amateur Athletes of America, Joint Basket Ball Rules Committee, the National Association of Golf Club Manufacturers, and the Sporting Arms and Ammunition Manufacturer's Institute are there. We find listed the National Association of Mopstick Manufacturers and the National Lightning Rod Manufacturer's Association, as well as all the metallurgical trade associations.

The book is a good reference volume for finding out what type of standardization activities are going on in any field. It gives no detailed technical information.

H. W. Gillett (20) -B-



MODERN Lectromelt Tool and Stainless Steel Furnace of the Door Charge Type . . . These Furnaces are also furnished in the Patent Swing Roof-Quick Top Charge Type for Drop Bottom Bucket Loading . . . Users include many of the Leading Heat and Corrosion Resistant Alloy Manufacturers . . . Their operations are marked by

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FOUNDRY PRACTICE & APPLIANCES (22)

Experiences with Die Casting. Zinc, Aluminum and Brass Die Casting. (Erfahrungen beim Spritzguss. Zink, Aluminium- und Messing- Spritzguss.) H. WALCHENBACH. *Werkzeugmaschine,* Vol. 36, May 31, 1932, pages 180-184.

1 The paper deals with practical experiences in die casting Zn, Al and brass. The accuracy of dimensions and the tolerances of die castings are considered. The savings in weight by die casting Al alloys are given. The savings in time and money to be effected by subsequent working and machining are stated. The prices of some auxiliary automobile parts made from Al sand and die casting alloys are compared. The composition of good die casting alloys is tabulated. The construction of the dies is considered with special reference to the flow of the metal which has particularly to be borne in mind. The wall thicknesses of die castings should be as uniform as possible. GN (22)

The Alloying of Copper with Tin and Antimony. (Das Legieren von Zinn mit Kupfer und Antimon.) *Deutsche Goldschmiedezeitung,* Vol. 35, Apr. 16, 1932, page 4.

2 Suggestion for the melting of alloys of Cu with the use of a preliminary alloy. GN (22)

Molds in Oblique Arrangement. (Schräg angeordnete Gussformen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 29, 1932, pages 215-216.

3 It is shown that long articles are suitably cast with an oblique arrangement of the mold. The casting from 2 sides of such articles offers disadvantages due to the formation of pipes. This is avoided by the new method. GN (22)

Small Machine for Dressing Molding Sand in Foundries. (Kleinmaschine für die Formsandaufbereitung in Giessereien.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 10, 1932, pages 279-280.

Description of the machine which separates Fe particles from the molding sand. GN (22)

Foundry Factors in Design of Steel Castings. W. G. HANAWALT. *Journal Society of Western Engineers,* Vol. 37, Apr. 1932, pages 82-87.

4 Correct design and application of steel castings involve a competent knowledge of foundry practice. Advantage should be taken of the various types of alloys available, also of heat treatment and metallurgical facilities. WHB (22)

The Determination of Unit Price for Simple Small Foundry Castings. (Het bepalen van stukprijzen voor eenvoudige kleinere gietstukken.) G. HOFSTEDE KOOPMAN. *Die Gieterij,* Vol. 6, Apr. 1932, pages 42-43.

5 The author reproduces in form of a table, with the method of use, the results obtained by the Federal Malleable Company of Milwaukee, Wisconsin, U.S.A., after 10 years research on this subject. The author states that the table can be safely used in determining prices of all small castings requiring no other stamping than by press. It also applies to 80% of the cases of hand-stamping when this is not too intricate. MPW (22)

Molding of Insulator Caps Made of Steel or Malleable Cast Iron. (Rationelles Formen von Isolatorkappen in Stahl und Temperguss.) M. HONOLD. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Feb. 21, 1932, pages 73-75.

6 The article outlines the various procedures to be followed in molding insulator caps to be made either of cast steel or malleable cast iron. GN (22)

A Modern High-Capacity Molding Equipment (Neuzeitliche Hochstleistungs-Formeinrichtung). B. KUERTEN. *Die Giesserei,* Vol. 19, Apr. 29, 1932, pages 168-169.

A semi-automatic arrangement for molding smaller parts such as grates, pipes, brake blocks, radiators, etc. in quantity production is described which can be adjusted so as to fill, tamp and finish small and large molding boxes. Ha (22)

A Steel Casting of Nearly 300 Tons. (Un Moulage d'acier de près de 300 Tonnes.) LEBRULY. *Revue de Fonderie Moderne,* Vol. 26, Feb. 10, 1932, pages 39-41.

7 Describes the molding and casting of a base plate of a hydraulic press, width 3.10 m., height 3.90 m., length 7.10 m.; weight 290 tons. Ha (22)

The Manufacture of Large Marine Engine Castings. *Foundry Trade Journal,* Vol. 46, Apr. 7, 1932, page 215.

A brief outline of a paper presented by F. Swift to the Middlesborough Section of the Institute of British Foundrymen. OWE (22)

Porosity Caused by Chaplets. (Porosität durch Kernstützen.) G. KREBS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Mar. 6, 1932, pages 98-100.

8 The author shows that failures which are apparent in castings when chaplets are to be used are not always due to the chaplets. The article deals with the precautions to be taken in using chaplets and shows that under these precautions the casting near the chaplet is just as dense as in other parts. GN (22)

The British Cast Iron Research Association. VIII. Importance of Founding to the Community. IX. Outstanding Features of the Work of the Association. *Foundry Trade Journal,* Vol. 45, Sept. 17, 1931, page 172; Oct. 1, 1931, page 202.

9 Further contributions to the discussion of the work being conducted by the Association for Foundrymen in Great Britain. OWE (22)

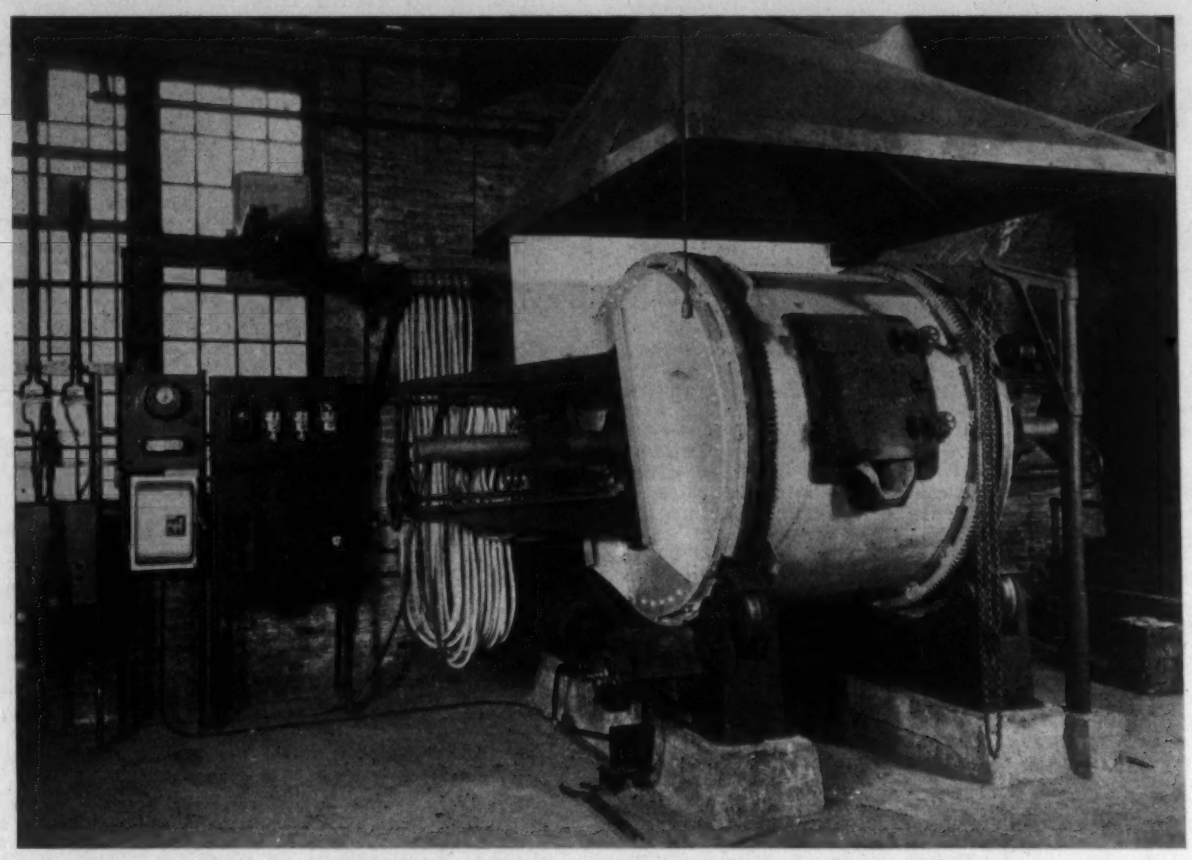
The New Magnetic Molding Machine. *Iron & Coal Trades Review,* Vol. 124, Feb. 12, 1932, page 282.

This new molding machine operates entirely electrically by an electromagnet the solenoid of which can be made up of several sections according to the length of movement required in the squeeze operation. The mechanical construction is described in detail; operating cost of this machine which is built by British Insulated Cables, Ltd., Prescot, England, is given as 3.07d per hour. Ha (22)

10 **The Practical Foundryman.** E. LONGDEN. *Foundry Trade Journal,* Vol. 46, Mar. 24, 1932, pages 191-192.

The manufacture of cast Fe is such a complicated problem that the foundry manager cannot possibly hope to maintain an efficient supervision over the dozen or so variables whose influence can affect the final qualities of cast Fe. OWE (22)

PRECISE CONTROL



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FURNACES & FUELS (23)

Immersion Melting with Gas. E. B. Dunkak. *Metal Progress,* Vol. 21, Mar. 1932, pages 73-77.

Melting and heating liquids, salts and metals by means of submerged, gas fired heating units is practical up to 1800° F. The advantages of immersion heating are fuel economy, ease and rapidity of temperature control and reduction of dross loss. WLC (23)

Developments in Gas Producer Practice. Victor Windett. *Rolling Mill Journal,* Vol. 5, June 1931, pages 427-430.

Abstract of a paper presented before the American Iron & Steel Institute in New York, May 22, 1931. See *Metals & Alloys,* Vol. 2, Oct. 1931, page 230. The author discusses the history, early developments, outstanding features, and the modern developments and improvements in the construction, operation and control of mechanical gas producers. He attributes the notable increase in gas producer capacity to complete mechanization and to the wide-spread application of instrumental control of operation. JN (23)

Industrial Furnaces for Gas. XIV. Industrial Ovens—General. XV. Ovens for Core Baking. Lawrence E. Biemiller. *American Gas Journal,* Vol. 136, Apr. 1932, pages 34-36; June 1932, pages 27-28.

The use of gas for drying operations such as core baking, mold drying, japanning, enamel, paint, and lacquer drying, lithographing, armature baking, ceramic and chemical drying, drying of foodstuffs, and many others, and the principles of oven construction, insulation, and ventilation are discussed. The use of cores and typical core mixes as well as core making practice are outlined. Cores are baked in either batch or continuous ovens. The design and operation of each type of oven are described. Core baking in continuous ovens results in large economies as a result of correct layout of oven and other related equipment. A plan view of an airplane motor foundry is shown. CBJ (23)

Modernization by Electric Heating. C. L. Ipsen & S. Martin. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 51-52, 55.

From a paper presented before the Associated Industries of Massachusetts, Oct. 1931. Over-all heating costs are discussed. It is only the actual cost of the source of heat that makes electricity appear more expensive. On all other costs, electric heating has a decided credit in its favor, and this may amount to more than the total cost of the source of heat. In treating steel, the total cost of electricity averages about 1% of the over-all cost of the product. Improvement in quality may amount to several %. Practically all heating in the plants of the General Electric Co. within the temperature range of available apparatus is electrical. The heating load at the Schenectady Works is practically equal to the motor load. All sheet steel punchings are annealed in 38 car-type electric furnaces. Large Cu wire and strip are annealed in H_2O-sealed furnaces with steam atmosphere, and fine wire is annealed in the retort type, gas-controlled atmosphere furnaces. MS (23)

The Combustion of Pulverized Fuel. S. B. Jackson. *Iron & Coal Trades Review,* Vol. 124, Mar. 25, 1932, pages 516-517.

The relation of the fineness of particles of powdered fuel to combustion time, heat liberation and temperature, preheating of combustion air and the effect of moisture in the coal are treated theoretically. Ha (23)

Electric Furnace in Automobile Industry. (Le four electrique dans l'industrie automobile.) Serge Heuland. *Journal du Four Electrique,* Vol. 41, Feb. 1932, pages 55-59.

A 3-ton Russ furnace installation at Mathis Works, used principally for making pearlitic cast Fe cylinder blocks is described. JDG (23)

Artificial Furnace Atmosphere Created from Ammonia. John E. Haig. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 48-50; Feb. 1932, pages 124-127.

After enumerating the sources of H and discussing the dissociation of NH_3 the author describes a simple and economical method of generating H_2 and N_2. Liquid NH_3, vaporized by the heat in gas previously dissociated flowing through a worm within the vaporizer shell, passes through a relief-valve, a needle-valve and a reducing-valve into a dissociator consisting of one or more tubes containing a catalyst, an electric heating unit, provision for a thermocouple, and an outer casing inclosing a suitable heat insulator. The NH_3 is dissociated by the catalyst at 1100° F. into 75% H_2 and 25% N_2 by volume. The catalyst is activated in the dissociator by passing through it while heated a stream of H. If pure N_2 or a gas with a lower content of H_2 is desired, the H_2 is burned. For drying the resultant product the gas is passed through a cooler, a condenser, an after cooler and drying towers. The cost of producing H_2 by this method is less than \$5.00/1000 ft.^{3} and for N_2, less than \$2.50/1000 ft.^{3} MS (23)

The Effect of Construction and Operation Methods on Heat Requirements of Pusher Furnaces. (Der Einfluss von Bau- und Betriebsweise auf den Wärmeverbrauch der Stossofen.) Werner Heiligenstaedt. *Archiv für das Eisenhüttenwesen,* Vol. 5, May 1932, pages 559-568.

Total heat requirements for pusher furnaces are given by heat balances. The individual members of the heat balance equations are taken up in order and explained through the help of specific practical problems. Relations between the gas temperature and flue gas loss, amount of charge and hearth surface, furnace wall and cooling water losses, most economical furnace and recuperator size are discussed. DTR (23)

Balanced Hearth Continuous-Flow Normalizing Furnace. *Iron & Coal Trades Review,* Vol. 124, Apr. 23, 1932, pages 665-666.

The desirable features of a normalizing furnace for alloyed steel sheets, particularly facilities for careful handling in order to avoid scratching and damaging, are set forth and a furnace installed at the Ebbw-Vale Works, Wales, is described. Ha (23)

The Brayshaw Gas Heated "Novopress" Furnace. *Iron & Coal Trades Review,* Vol. 124, Apr. 8, 1932, page 590.

The gas and air flow are regulated by a hand wheel which gives correct proportion of gas and air under all conditions of heating, and automatically opens the flue damper. At 900° C. the gas consumption averages about 1.5 ft.^{3}/lb. of load. Ha (23)

REFRACTORIES & FURNACE MATERIALS (24)

Magnesium Orthosilicate as Refractory. (Magnesiumorthosilikat als feuerfester Baustoff.) F. Reinhart. *Tonindustriezeitung,* Vol. 56, Mar. 17, 1932, pages 323-324.

Since pure magnesium orthosilicate is rarely to be found as mineral and since it proved excellently fit as refractory material, methods have been developed to produce it artificially. To attain this the German patent No. 417360 uses the following procedure: Magnesium salt as, for instance, $MgSO_4$, is melted together with quartz sand and the magnesium orthosilicate is thus formed at temperatures between 1000° and 1500° C. A later Austrian patent No. 121249 utilizes the magnesium hydrosilicates, as they are available in the form of the minerals talc and serpentine. The method suggested by this patent is described. Due to the high temperature stability and the high resistance to chemical attack magnesium orthosilicate is suitable for use as refractory brick for metallurgical furnaces, glass melting furnaces, as lining for heating furnaces, muffles and the like. The applicability, therefore, is the same as that of aluminum silicate. GN (24)

Works Tests on Refractories and Service Conditions. R. J. Sarjant. *Transactions Ceramic Society,* Vol. 30, Feb. 1931, pages 46-67.

The author discusses the correlation of fundamental, simulative and service tests on refractory materials. In the present state of knowledge the service test must remain the ultimate arbiter in the selection of refractories. Simulative tests have limited application. The preferable course is the development of fundamental tests, which have been shown in a number of cases to give definite indications of performance value. Tables with numerical values of physical properties as expansion, porosity etc., important for steel works practice, are given for a number of materials. Ha (24)

Service of Refractories Is Improved During 1931. *Steel,* Vol. 90, Jan. 4, 1932, pages 168-169.

The year 1931 may be characterized by the wider use of high-alumina refractories of the mullite and sillimanite type, improvements in chrome and magnesite brick, the use of silicon carbide as a refractory to withstand excessive abrasion, and studies on 2 new types of refractories, beryllium oxide and euhedral corundum. Other outstanding developments are a new mineral bonded, hydraulically pressed, unburned magnesite brick for open-hearth wall construction, a new periclase magnesite brick for open-hearth roofs, a new wet chrome cement, and a new plastic chrome coating material. JN (24)

How to Attain a Long Life of Cupola Lining. (Wie erreicht man eine lange Lebensdauer des Ofenfutters im Kupolofen.) A. Bandermann. *Zeitschrift für gesamte Giessereipraxis,* Vol. 53, Mar. 20, 1932, pages 118-120.

Practical hints are given as to how to attain cupola linings of high durability. The lining materials best fitted are discussed and the methods of lining are considered. GN (24)

On Recent Ceramic Patents. (Von neueren keramischen Patenten.) H. Hirsch. *Berichte der deutschen keramischen Gesellschaft,* Vol. 13, Feb. 1932, pages 140-148; *Tonindustriezeitung,* Vol. 56, Apr. 14, 1932, pages 407-410.

Including discussion. The new patents are described under the headings: (1) improvement of the raw material, (2) grinding and dressing, (3) shaping, (4) fluxes, (5) special refractories. In the latter group are mentioned patents covering the improvement of refractories by embedding of metals. (6) furnaces, in particular tunnel furnaces. GN (24)

The Action of Carbon Monoxide on Refractory Materials. Part I. Experiments on the Disintegration of Fire Clay Products by Carbon Monoxide. Part II. Further Experiments on the Disintegration of Fire Clay Products by Carbon Monoxide. W. Hugill, H. Ellerton & A. T. Green. *Institution of Gas Engineers, 22nd Report of the Refractory Materials Joint Sub-Committee Copyright Communication* No. 39, Sept. 1931, pages 26-30; Sept. 1931, pages 30-33; *British Refractories Research Association Bulletin* 25, 1931, pages 14-23; Bulletin 26, 1931, pages 32-43.

Of 11 specimens 5 resisted disintegration by CO (flow-1 l./hr.) at 420° C. for 20 hrs. Others showed breakdown. Disintegration is mainly localized at the Fe spots. Analysis showed no relationship between Fe content and disintegration. However, less than 0.1% ferruginous matter extracted by bromoform differentiated resistant bricks. Part II. Experiments of I were extended to 200 hrs. Three resisted disintegration. There is no obvious relationship between disintegration by CO and permeability. AHE (24)

Investigations of the Heat Conductivity of Refractory Bricks. (Untersuchungen über das Warmeleitvermögen feuerfester Steine.) Anton Kanz. *Mitteilungen aus dem Forschungsinstitut der Vereinigte Stahlwerke Akt.-ges. Dortmund,* Vol. 2, No. 10, 1932, pages 223-234.

An improved method of measuring the heat conductivity of refractory materials in the form of a thin plate is described which has the advantage of permitting a quick and accurate determination of the conductivity with compensation for heat losses. The arrangement is fully described and the results of a great number of silica, corundum, bauxite, chromite and other bricks are tabulated. The values found agree very well with those determined by other more complicated methods. It could be stated that silica bricks have a heat conductivity which increases with increasing temperature, more below 400° C. than above. A heat treatment of longer duration which causes formation of tridymite increases the heat conductivity considerably. Other refractories showed irregularities below 300° C., which are very likely due to structure changes. It is recommended to investigate the refractory properties more closely in the range between 100 and 600° C. 13 references. Ha (24)

Magnesite. *British Clayworker,* Vol. 40, 1932, pages 391-392.

The varying conduct of refractories is due to differences both in the chemical composition and physical structure of the raw materials. Trouble with the finished brick is also due to the method of grinding, tempering, and bonding and the system of conducting the drying and final firing. A brief discussion on crucibles prepared from magnesite, and the increased use of magnesite for basic-lined converters in the refining of Cu and Ni and in the metallurgy of Ag is included. WAT (24)

Refractories for the Iron and Steel Industry. THOMAS W. HIND. *Iron & Steel of Canada,* Vol. 15, June 1932, pages 67-69.

Address before the Montreal Chapter, A.S.S.T., in which various refractories which have been of service in the Fe and steel industry are discussed. The physical properties of refractories, the effects of gases and of slag erosion on refractories and the methods of manufacture employed in the production of bricks are described. OWE (24)

Heat Insulation Developed for Every Purpose. B. TOWNSHEND & E. R. WILLIAMS. *Chemical & Metallurgical Engineering,* Vol. 39, Apr. 1932, pages 219-222.

A summary of known data is given as a guide to selecting heat resisting materials. PRK (24)

Structural Materials for Modern Heat Technology. F. H. NORTON. *Chemical & Metallurgical Engineering,* Vol. 39, Apr. 1932, pages 226-228.

Tables and figures give the more important properties of the common types of refractories which are in use. PRK (24)

The Design and Operation of Open-Hearth Furnaces. Part III. C. W. VEACH. *Rolling Mill Journal,* Vol. 5, Mar. 1931, pages 175-178, 190.

The brick used in open-hearth construction should have a high density factor to resist permeation by gases and furnace erosion. Conformity to shape and dimensions so as to produce close joints is also important. The quality of silica brick may best be judged from its density. The old process of hand molding is now largely superseded by the method of "drop molding," which produces a more compact article. The possibilities of molding silica brick under hydraulic pressure promises to revolutionize the industry, producing brick as smooth and dense as polished granite. The continuous or tunnel kiln is coming into wider use for all brick manufacture. Both chrome brick and magnesite brick are now used in basic open-hearth linings. There has been a great improvement in checker construction with silica brick. The new design combines the advantages of the straight perpendicular checker flues with an additional flue at a downward slant of 45°. The author also gives a detailed description of a complete modern furnace of 100-150 tons capacity. JN (24)

The Design and Operation of Open-Hearth Furnaces. Part V. C. W. VEACH. *Rolling Mill Journal,* Vol. 5, May 1931, pages 335-338, 350; June 1931, pages 407-410, 432.

The material used for lining the open-hearth furnace is usually magnesite brick although substitutes such as chrome brick, unburned magnesite, and a mixture of magnesite and cement have been used. The inside dimensions of this magnesite brick lining determine the capacity of the hearth. The bottom of the hearth is usually covered with two or more courses of magnesite brick. It requires from 7 days for a small furnace to 26 days for a 250-ton furnace to "burn in" a new magnesite bottom. In recent years, substitutes for magnesite have been developed from dolomitic clinker. These are cheaper than magnesite and may be used in furnaces that are kept in almost continuous operation. However, the dolomitic clinker must have a silica content of not less than 3% and not more than 9% and must not be used with slags high in silica. The advantages of magnesite furnace bottoms are long length of service and a minimum of repairs. The use of dolomitic clinker bottoms offers a considerable saving in first cost and very little repairs for the first year or two. It is claimed that after a year of service the lime-magnesia contents of the 2 bottoms become quite similar. The author believes that for a 5-year period the dolomitic bottom will show a good margin of economy over the magnesite. The aim in constructing a furnace bottom is to obtain a dense material with a high fusion point, free of pores, and as free as possible of harmful impurities. Even under the best operating conditions, however, corrosion of the bottom will occur from the introduction of foreign elements with the charge. The most harmful of these is silica. Other harmful impurities that occur mixed with steel scrap are Pb, Sn, Cu, Zn, Sb, etc. JN(24)

The Motion Picture as an Aid to Refractories Research. THOMAS S. CURTIS. *Journal American Ceramic Society,* Vol. 15, May 1932, pages 114-123.

The apparatus and technique employed in the study of plastic flow at high temperatures, crystal growth, thermal expansion, vitrification, spalling, etc., are described, and the method of preservation of permanent records of such phenomena in the act of occurrence is given. A description is also given of the physical changes requiring days or weeks for their development which may be depicted in a few minutes on the motion picture screen. WAT (24)

New Refractories Tested in Drive for Lower Costs. HOBART M. KRANER (Westinghouse Elec. & Mfg. Co.) *Steel,* Vol. 90, Jan. 18, 1932, pages 27-28.

Present-day tendencies in the metallurgical field are seen in a wider use of cheaper refractories such as fireclay, mullite and cyanite; the development and more general use of new ramming and patching cements containing corundum, mullite and silicon carbide; the substitution of mullite for silicon in electric furnace roofs and the substitution of chrome brick for magnesia in the bottoms of basic steel furnaces; the extensive use of silicon carbide in places subject to excessive abrasive action; the use of graphite crucibles for melting Al; and the development of a number of new heat insulating materials. JN (24)

The Impermeability of Refractory Materials to Gas. (Ueber die Gasdichtigkeit von feuerfesten Massen.) F. DURAU. *Zeitschrift für technische Physik,* Vol. 13, No. 5, 1932, pages 228-233.

Tests with several kinds of glazed and unglazed tubes showed that at 1200° C. no gas from the inside passes through the walls. On the other hand, gas is continually given off which is ascribed to a disintegration of substances enclosed in material, especially in outer layers. Occluded gases may also be the reason for this phenomenon. Ha (24)

Refractory Joining Cements. A. T. GREEN, F. WHEELER & H. BOOTH. *Institution of Gas Engineers, 22nd Report of the Refractory Materials Joint Sub-Committee, Copyright Communication* No. 39, Sept. 25, 1931, pages 33-41.

The use of the refractoriness-under-load test in the testing of cements is illustrated. AHE (24)

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More and more Norton Magnesia Cements are being used in large and small electric induction melting furnaces—furnaces such as the Ajax-Northrup—for ferrous and non-ferrous metals.

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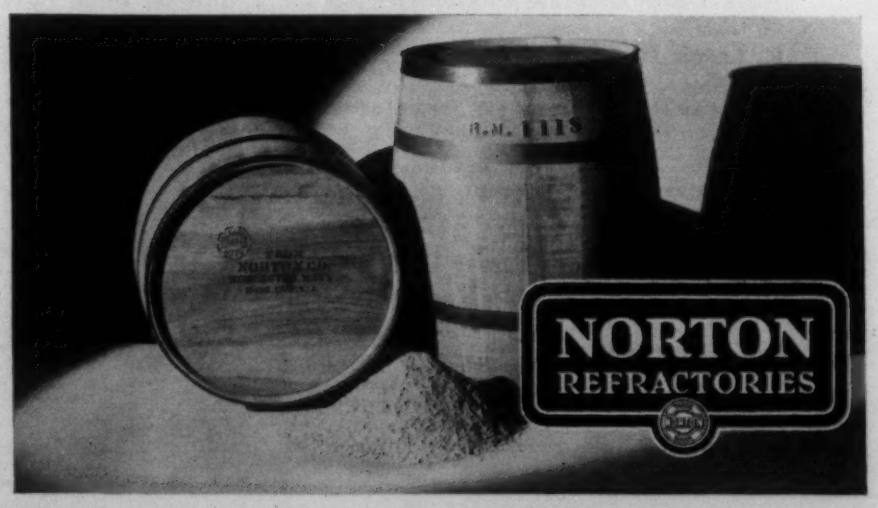

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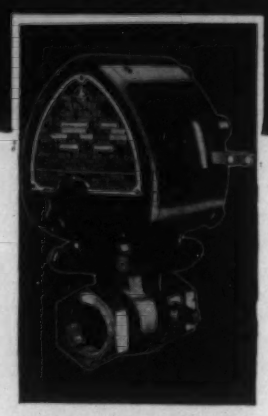

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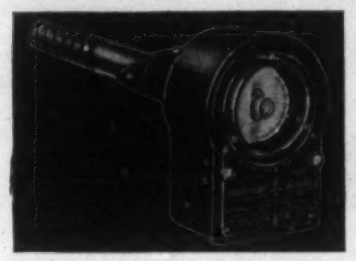

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MANUFACTURERS' LITERATURE REVIEWS

1 **Electric Furnaces**—A leaflet issued recently by the Pittsburgh Electric Furnace Co., Pittsburgh, Pa., describes their Lectrosimplex furnace, an inexpensive rapid melting furnace of moderate size. It is available in several sizes and styles.

2 **Stainless Clad Steel**—The Ingersoll Steel & Disc Co., 310 S. Michigan Ave., Chicago, Ill., has issued a folder describing the composition, method of manufacture and fabrication of their stainless clad steel as well as illustrating and listing many applications for this new low cost corrosion resisting material.

3 **Protective Coatings**—A recent pamphlet sent out by the Quigley Co., Inc., 56 West 45th St., New York, N. Y., illustrates a number of applications of their Triple-A protective coatings for preventing corrosion. The distinctive properties of these coatings are described.

4 **Erichsen Testing Machines**—The Bock Machine Co., 3816 Colerain Ave., Cincinnati, Ohio, has distributed a booklet describing the Erichsen machine for testing metal sheets and strips. A detailed description of the test is given as well as directions for the use of the machine. A number of curves show the relation between the thickness and the "Erichsen value" of good metal sheets.

5 **Atmosphere Control Furnaces**—Bulletin 1132 of the Hevi Duty Electric Co., Milwaukee, Wis., describes their method of controlling the atmospheres in their box type furnaces. Specifications for several types of furnaces are given and a cross-section diagram shows how the "Atmosphere Control" works.

6 **Using Paint as Light**—A most attractive booklet issued by the New Jersey Zinc Co., 160 Front St., New York, N. Y., is an A.B.C. summary of a highly technical paper prepared by Mr. Gamble of their Research Division. The simplicity of the charts and the definitions of lighting terms given should enable anyone to solve his lighting problems with ease.

7 **Surface Pyrometers**—Bulletin No. 30 of the Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y., describes their surface pyrometers. A unique feature of these instruments is that contact and reading of temperatures do not have to be simultaneous.

8 **Diamite**—This alloy white iron is discussed in a folder distributed by the Weatherly Foundry & Mfg. Co., Weatherly, Pa. One of its principal features is its great hardness. Castings made from it are recommended for troughs for handling ash, rock and coal, liners for chutes, pulverizer liners, crusher jaws, gears, etc.

9 **Beryllium Copper**—A pamphlet prepared by the American Brass Co., Waterbury, Conn., is devoted to beryllium copper, a heat treatable copper alloy. The heat treated material possesses higher tensile strength, fatigue limit and hardness than any other copper alloy heretofore produced commercially.

10 **Anodes**—A booklet sent out by the Roessler Hasslacher Co., 10 East 40th St., New York, N. Y., describes and illustrates a number of designs of their standard anodes supplied in Purozinc, Duozinc, Cad-a-loy and tin.

11 **Anti-Carbonizing Compound**—A leaflet distributed by the Frederick Williams Co., 125 Cedar St., New York, N. Y., describes their "Nocasine" for use in limiting areas in case-hardening metal parts. It tells when and how to use the compound.

12 **Steel Products**—A complete list of their products has been prepared by the Republic Steel Corporation, Youngstown, Ohio.

13 **Monel Metal**—Bulletin T-5 of the International Nickel Co., 67 Wall St., New York, N. Y., discusses the engineering properties of Monel metal, as to physical constants, strength and ductility, corrosion resistance, working properties, etc.

14 **Constant Temperature Water or Oil Bath**—Bulletin 1220 of the American Instrument Co., Washington, D. C., describes a thermostatically controlled constant temperature bath which holds temperatures to 0.03° C. It is intended for all applications where accurate temperature control over extended periods of time is desired.

15 **Welding Wrought Iron**—A pamphlet issued by the A. M. Byers Co., Pittsburgh, Pa., gives the procedure to be used in welding wrought iron. A number of the outstanding characteristics of wrought iron are discussed. The same company has also issued an abbreviated catalogue of information on wrought iron products.

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METALLURGICAL ABSTRACTS

A digest of the important metallurgical developments of the world

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Note:—The markings between the columns of abstracts will be there each month from now on. When the next index is made the references will be to tenths of pages, right or left, and the rule will simplify finding the material desired.

GENERAL (0)

Report of Ontario Research Foundation for 1931. H. B. SPEAKMAN. Published by H. H. Ball, Toronto, 1932, 34 pages.

The metallurgical department of the Foundation aided some 60 Ontario firms on metallurgical problems in 1931. For 1932 an information service is to be given to all firms of the Province without requiring any membership fee in the Ontario Metal Industries Research Association. Work on causes of failures of metallic materials and similar problems as well as information service and plant visits comprised most of the service work. Research on fundamentals was concerned with preparation of sponge iron from low grade ores, high temperature malleability of carbon and alloy steels, uniformity of heat-treatment of high speed steel in commercial practice, etc. Work has been begun on problems in applied mechanics and mathematics relating to metallurgical materials. HWG (0)

National Physical Laboratory Report for the Year 1931. Department of Scientific & Industrial Research. H. M. Stationery Office, London, 1932. Paper, 8 × 12½ inches, 313 pages. Price 15s.

While this report does not go into technical details, it contains a good many interesting metallurgical high spots. Some of these are in the report of the metallurgical department, and some in that of the engineering department. Among these are the finding that pure, distilled, free from oxide inclusions, Be is, after all, ductile; that heat-treated Cu-Be alloy which has been heralded as of high endurance limit, will require very long-continued test since fracture has occurred after 65 million cycles; that reliable Brinell values, even in steel of 400 Brinell, require that the thickness of the specimen be 20 times the depth of the impression; that wear of steel pivots in sapphire bearings seems to involve chemical combination of the steel with the oxygen of the Al_2O_3; and that nitralloy gages will not "wring" together properly, probably due to Al_2O_3 inclusions.

Beside the continuing work on fatigue, bearing metals and lubrication, thermal conductivity, boiler plate failure, etc., etc., new work is being undertaken on wear testing, and on methods of evaluating the formability of deep-drawing stock. In connection with the work on creep, new equipment has been installed with temperature controlled within about 0.25°C. and deformation measurements made to a hundred thousandth of an inch on a 5 inch test length, or 2 millionths of an inch per inch. The effect of oxidation or of SO_2 attack at high temperatures is being studied in connection with creep problems.

Progress is being made in the preparation of pure iron. Since the Bureau of Standards is also making great progress in this line, it seems likely that knowledge of the properties of really pure iron and its alloys will be considerably advanced in the next few years. H. W. Gillett (0) -B-

Handbook of Inorganic Chemistry. Complex Cyanides of Iron. (Handbuch der anorganischen Chemie. Komplexe Cyanide des Eisen.) Vol. 4, Part 3, Section B, Division 2. Edited by R. Abegg, Fr. Auerbach & I. Koppel. S. Hirzel Verlag, Leipzig, 1932. Paper, 7 x 10 inches, pages B 465-B 674. Price 24 RM.

This section of the treatise on the chemistry of Fe and its compounds deals with complex cyanides of ferrous and ferric Fe. Besides the description of the composition and properties of the compounds, there are chapters on the colloid chemistry of these cyanides and one on the technology of their manufacture. A bibliography of about 1,400 references, dating from 1710 to 1932 is appended.

H. W. Gillett (0)-B-

Metallurgy. EDWIN GREGORY. Blackie & Son, Ltd., London, 1932. Cloth, 6¼ × 9 inches, 284 pages. Price 17s 6d.

This text book is aimed to give engineers an introduction to both ferrous and non-ferrous metallurgy. Obviously not everything that might be included can be covered in so small a volume. The selection of material is rather well done, even though some of the sections appear a bit sketchy. The book is written from the metallographer's point of view, though properties of materials and engineering uses for which they are fitted are not neglected. Corrosion is dealt with briefly, chiefly in connection with 18 and 8. High temperature properties are also briefly discussed, this section being marred by almost unrestrained acceptance of the "time-yield" method as a short cut. Fatigue might well have received mention along with the other causes of failure.

The instructions for calibration of pyrometers, to take the freezing point of NaCl and correct the pyrometer readings in accordance with that calibration if they come within ± 10° of 800°C. hardly seem adequate for many industrial uses of pyrometers in metallurgy.

Relatively few references to the literature are given, and many incidental comments, such as the statement that flaky alloy steel is due to local carbon segregation, producing tiny areas of an air hardening tendency, would be more useful to the reader if adequate references, by which the subjects could be followed further, had been given. The author evidently expects his students to have access only to the Journal of the Iron and Steel Institute and the Journal of the Institute of Metals. Grossmann and Bain's simplified diagram for high speed is used, but their book is ignored, only a Journal of the Iron and Steel Institute reference being given. Nor is Monypenny's Stainless Iron and Steel referred to.

The book starts with the blast furnace, deals very briefly with cast iron, malleable iron and wrought iron, more fully with the manufacture of steel, then turns to equilibrium diagrams and to the metallography and heat-treatment of steel. Alloy steels are discussed, case hardening commented on fairly fully, nitriding very sketchily. The stainless steels get special attention, then cold working processes are discussed.

Sixty pages are then devoted to the more common nonferrous alloys, the treatment being very brief, but surprisingly clear and comprehensive for so small a space. The omission of zinc-base die castings leaves out a class of alloys of considerable engineering importance. A brief discussion of welding completes the book.

On the whole, the engineer who has assimilated the contents of this book should have a good start toward an understanding of the how and the why of the manufacture of most important metallurgical materials of construction.

H. W. Gillett (0) -B-

National Directory of Commodity Specifications. C. W. INGELS. *U. S. Bureau of Standards Miscellaneous Publications* No. 130, 1932. Cloth, 8 x 11 inches, 548 pages. Price $1.75.

This is the first revision of the Directory. One section of 88 pages is devoted to ores, metals and manufactures, which include the existing specifications of all such bodies as the A.S.T.M., American Railway Association, S. A. E., Federal Specifications Board, etc., on dimensions, composition or properties. Recommended practices are also included. Other commodities are dealt with in the same way. The volume is thoroughly indexed. Only American specifications are included. H. W. Gillett (0)-B-

PROPERTIES OF FERROUS ALLOYS (3)

Characteristics of Alloyed Cast-Iron. F. W. Shipley. *S. A. E. Journal,* Vol. 30, Mar. 1932, pages 120-128.

Increased quality, which is reflected through higher valve-seat hardness and improved microstructure, can be obtained by additions of Ni and Cr in automobile-cylinder Fe. See *Metals & Alloys,* Vol. 3, May 1932, page MA 118. Ha (3)

New Rustless Iron Alloy. R. P. De Vries (Ludlum Steel Co.). *Metals & Alloys,* Vol. 3, Feb. 1932, pages 49-50.

The author discusses the working, soldering, welding, riveting, pickling, polishing and heat treatment of a new stainless material of 0.10% C, about 16% Cr, about 1% Si, about 1% Cu, about 0.40% Mn and S and P 0.03%. Tensile properties at room and elevated temperatures are tabulated. WLC (3)

Wear of Armatures and How It is Combated. (Verschleiss von Armaturen und seine Bekampfung.) Wahl. *Maschinenkonstruckteur-Betriebstechnik,* Vol. 64, Sept. 10, 1931, pages 191-194.

Wear in armatures is due to corrosion, rubbing and radiation. The effect of alloying and chances for estimating the life of armatures from the properties of its materials are discussed. Coating the metal is advocated to prevent wear. MAB (3)

Relations between the Various Mechanical Properties of Cast Iron Among Themselves and Its Structure. (Relations entre les divers propriétés méchaniques d'une part, les Propriétés méchaniques et la Structure d'autre Part des Fontes de Moulage.) Ch. Baron. *Revue Universelle des Mines,* Series 8, Vol. 5, July 15, 1931, pages 33-35.

The tests made on 17 kinds of cast Fe on the relation of tensile, bending and shearing strength among themselves and to the wall-thickness and chemical composition show that preferably an Fe with a pearlitic structure should be used in order to obtain the best possible elastic limit and resistance to fracture. Bending tests on small specimens are quite sufficient to estimate the quality of a cast-Fe. Ha (3)

The Notch Sensitivity of Cast Iron Stressed by Bending. (Ueber die Kerbempfindlichkeit von Gusseisen bei Beanspruchung auf Biegung.) F. Roetscher. *Maschinenbau,* Vol. 11, Feb. 18, 1932, pages 79-80.

It is shown that cast Fe under bending stresses is sensitive to notches, and the sensitivity increases in proportion to the depth and sharpness of the notches. This is explained by the distribution of stresses in highly stressed cross sections. RFV (3)

Permanent Growth of Gray Cast Iron. W. E. Remmers. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 219-229.

Includes discussion. See *Metals & Alloys,* Vol. 1, Oct. 1930, page 791. (3)

Tool Steels for Dies. (Werkzeugstähle für Schnitte.) F. Rapatz & H. Pollack. *Feinmechanik und Präzision,* Vol. 40, June 1, 1932, pages 101-103.

The selection of a steel suitable for dies should be guided by the following points: (1) shape of the die, (2) capacity required of the die, (3) thickness of the material to cut, (4) nature of the material to be cut. The shape determines whether the die is to be hardened in oil or water; complicated forms are hardened in oil as then less tendency exists for warping or deforming. If thick material is to be cut a tougher steel must be used; the toughness is inversely proportional to the wear resistance; the unalloyed C steels have the greatest toughness but wear most. The composition of some of the most used tool steels is given and their heat treatment briefly described. Ha (3)

Nickel-Iron and other Nickel Alloys with Special Physical Properties. (Nickel-Eisen und andere Nickel-Legierungen mit besonderen physikalischen Eigenschaften.) U. Retzow. *Elektrotechnik und Maschinenbau,* Vol. 50, June 12, 1932, page 349.

On the basis of the diagram of state of pure Ni-Fe alloys 2 groups are distinguished: the irreversible alloys with from 0 to about 30% Ni, with temperature hysteresis of the magnetizability, and the reversible alloys with higher Ni-content. If C is present as alloying constituent, up to 0.5% the border shifts to lower Ni-content and a new group is formed between the 2 first named groups, the alloys of which are not magnetizable at normal temperature. The alloy with 36% Ni shows the highest specific heat but the least heat expansion which combined with very favorable tensile properties makes this alloy very useful for many technical applications especially in the construction of instruments. Fe-Ni alloys are particularly used because of their peculiar magnetic properties, in particular high magnetizability with small magnetizing forces; there is, however, a great dependence on temperature, with increasing temperature the magnetic saturation decreases. The addition of Co tends to produce a more uniform permeability for changes of small electric fields (use in Pupin coils). Alloys from 40 to 50% and with 20% Ni show particularly the phenomenon of magneto-striction which is sometimes utilized for keeping the frequency of oscillating circuits constant. For temperatures below freezing point these properties do not hold good. Here pure ferro-magnetic behavior takes place. Alloys of 35-36% Ni show the maximum of specific resistance, 0.85 ohms/mm.^{2}/m. The thermoelectric property, also with additions of Cr and Mo is used in thermocouples up to about 1000° C. Ha (3)

Some Notes on Blue Brittleness. Leland Russell van Wert. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, pages 230-246.

Includes discussion. See *Metals & Alloys,* Vol. 2, Nov. 1931, page 243. (3)

Lattice Distortion and Hardness of Heat-treated Tungsten Magnet Steels. W. A. Wood. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Ser. 7, Vol. 13, Feb. 1932, pages 355-360.

The specimens were subjected to various heat treatments. Decrease in magnetic quality and hardness on heating to about 900° C. is due to disappearance of lattice distortion. Recovery of these properties at 1250° C. is due to re-introduction of the distortion. RHP (3)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)

Resistance of Copper, Tin-Bronzes and Tin Towards Attack by Inorganic Acids. (Zur Kenntnis der Widerstandsfähigkeit von Kupfer, Zinnbronzen und Zinn gegen anorganische Säuren.) W. Claus & H. Fincke. *Zeitschrift für Metallkunde,* Vol. 24, Mar. 1932, pages 64-65; May 1932, pages 112-114.

The attack of Cu-Sn cast alloys, annealed and unannealed, with 3, 6, 10, 14, 20 and 32% Sn, and of pure Sn, by HCl solutions with 3.03, 4.8 and 15.3% HCl, for periods of 8 and 50 hours was studied. The weight losses are expressed in graphs. The second article includes tables and diagrams showing weight loss against time for HCl, H_2SO_4 and H_3PO_4. RFM (4)

Corrosion of Metals by Milk and Its Relation to the Oxidized Flavors of Milk. E. S. Guthrie, C. L. Roadhouse & G. A. Richardson. *Hilgardia,* Vol. 5, Mar. 1931, pages 425-453.

Experiments have been made at the California Agricultural Experimental Station on the behavior of the following metals and alloys in contact with sweet milk: Cu, Ni, Ni-Cu-Zn alloy, Monel metal, Ambrac (Cu 75, Ni 20, Zn 5), brass Ni bronze, Cr-Fe alloys, tin-plated Ni, Al, Cd, and Ni-Cr austenitic steel. Conditions of test included continuous and intermittent immersion, exposure during pasteurization, electrolytic corrosion. The results confirm the outstanding suitability of the Ni-Cr austenitic steels for use in dairy equipment, as they do not produce a metallic flavor. Other materials were not entirely satisfactory as they partly dissolve, or give a flavor. Ha (4)

Corrosion of Metals by Milk. Effects of Operating Conditions on Corrosion in Various Parts of Pasteurizing Equipment. H. A. Trebler, W. A. Wesley & F. L. LaQue. *Industrial & Engineering Chemistry,* Vol. 24, Mar. 1932, pages 339-350; July 1932, page 839.

Presented before the Division of Industrial and Engineering Chemistry at the Buffalo, N. Y. meeting of the American Chemical Society, Sept. 1931. 6 references. It was found that Ni is suitable for equipment used in transportation and storage of milk at ordinary temperatures, heating milk to the pasteurizing temperature and holding it at that temperature, and cooling milk from 18° C. and handling it below that temperature. Ni should not be used in contact with milk cooling in the range from 63° to 18° C. The Cr-Ni alloy containing 12 to 15% Cr is suitable for all types of pasteurizing equipment. Bare Cu and Ni-Ag should be used with caution in the final stages of heating milk and in the initial stages of cooling milk. MEH (4)

Corrosion Prevention Methods in Brine Tanks and Ice Making Tanks. R. S. Wheaton. *Power,* Vol. 75, June 7, 1932, pages 857-858.

H_2O temperature must be below 40° F. before introducing $CaCl_2$ or NaCl, since warm brine is corrosive. 100-125 lbs. of $Na_2Cr_2O_7$/1000 ft.^{3} of brine should be dissolved in the tank; if the brine is made with NaCl, up to 200 lbs. of $Na_2Cr_2O_7$ is necessary. Where cans are leaky and coils thin due to rust, the treatment of brine with $Na_2Cr_2O_7$ will clean off rust to such an extent that leaks will result. Old brines should be thrown away if new cans are to be used. AHE (4)

Abrasion of the Surface of Rolls. (Abnutzung von Walzenmänteln.) *Tonindustriezeitung,* Vol. 56, July 21, 1932, pages 742-743.

A comparison between the wear of chilled rolls and Mn hard steel rolls shows the great superiority of the latter. GN (4)

The Erosion of Steam Turbine Blades. F. W. Gardner. *Engineer,* Vol. 153, Feb. 5, 1932, pages 146-147; Feb. 12, 1932, pages 174-176; Feb. 19, 1932, pages 202-205; *Power,* Vol. 75, Mar. 29, 1932, page 490.

General discussion is given of the nature of blade erosion. Rate of erosion depends upon the following factors: blade material, their velocity, the quantity of water which strikes them, the vacuum in the turbine at the point in question and the percentage of air or other non-condensable gas in the steam. A method of blade protection is outlined in which an independent shield of very hard material is brazed on to the blade. The shield can be removed and renewed easily. Photographs are given showing typical protected and unprotected blades after continued service. Research carried out by the author's firm led to the conclusion that hardness is the most important property in determining the resistance of a material to erosion. Various types of materials were tested including some non-ferrous alloys, C steels, Mn steels, stainless steels, austenitic steels and other Ni-Cr alloys, high-speed tool steels, and steels with special treatment such as Cr plating or nitriding to produce a hard surface layer. Micrographs are given showing typical erosion cavities in austenitic steels and in W steel. The W steels gave the best results of the materials tested. A method is given for estimating the pressures produced on the blade surface by the impact of water drops. AHE+LFM (4)

Prevention of Valve-Seat Erosion. Edward M. Getzoff. *S.A.E. Transactions,* Vol. 26, 1931, pages 361-364.

See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 32. (4)

Corrosion by Cavitation in a Diffusor. (Korrosion durch Kavitation in einem Diffusor.) H. Schroeter. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, May 21, 1932, pages 511-512.

Results of tests with bakelite, Zn and gray Fe made in a pressure pump are described. The corrosive attack seemed to be due more to mechanical than any other reasons. Ha (4)

The Corrosion Problem. III. Aluminum, Lead, Copper. (Zur Korrosionsfrage. III. Aluminium, Blei, Kupfer.) L. W. Haase. *Gas und Wasserfach,* Vol. 75, May 14, 1932, pages 372-374.

Commercial Al is practically unfit for water lines. Al, when used for cooking utensils, is also more or less severely attacked. Pb pipes, tinned or sulphurized Pb pipes and hard Pb pipes are attacked by cold water, when the water is acid and contains free CO_2 but only when O is also present. Effective protective layers are formed only in water rich in $CaCO_3$ and containing O, provided an increased content of H_2S, humus substances, chlorides, nitrates and sulphates does not counteract the formation of such layers. With few exceptions Cu resists the attack of cold, salty and hot water. GN (4)

Topochemistry of Corrosion and Passivity III. (Zur Topochemie der Korrosion und Passivität III.) E. Pietsch, E. Josephy, B. Grosse-Eggebrecht & W. Roman. *Korrosion und Metallschutz,* Vol. 8, Mar. 1932, pages 57-66.

The authors point out that the local elements occurring during corrosion cannot be checked experimentally and differ fundamentally from those "model elements" consisting of 2 different short circuited metal electrodes in an electrolyte, on account of their bi-dimensional phase boundaries. Based on the results in contact catalysis, the writers assume in the theoretical part of the paper that the primary effect of the corrosion phenomenon and of the heterogeneous catalysis is identical, i.e. an adsorption of the corroding reagent takes place at "energetically preferred surface potentials," mainly at crystal edges and corners of individual crystals, at grain boundaries of poly-crystalline material and at inhomogeneities of otherwise homogeneous surfaces, caused by disturbances during crystal growth or by mechanical stress, or at heterogeneous phase boundaries as for instance: Zn/Pt. If there is an opportunity of compensating free charges, 2 effects will occur (A) a compound is formed with the aid of the solid body of surrounding lattice particles (formation of adherent rust or of $ZnSO_4$) and (B) "recombining" and separation from the surface due to the lower adsorption potential as for instance in case of H_2. The experimental part of the publication refers to an investigation on soft Fe on which the correlation of the grain boundaries to the primary corrosion effect at homogeneous surfaces was systematically studied. The difficult pre-treatment is described and a linear dependence of the dissolution process on the total length of grain boundaries was established. The paper includes 45 references. EF (4)

Optical Investigations into the Passivity of Metals. I. Iron and Steel. (Optische Untersuchungen zur Frage der Passivität der Metalle. I. Eisen und Stahl.) L. Tronstad. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 158, Feb. 1932, pages 369-397.

Optical measurements previously made on electro-chemically activated and passified Fe and Ni mirrors (*Nature,* Vol. 142, 1929, page 373) were extended to the following Fe and steel samples: 0.04% C steel, 0.4% C steel, Flodin Fe with 0.01% C, pearlitic steel with 0.82% C and 1.3% C steel, Cr-Ni steel with 0.15% C, 0.54% Cr and 3.1% Ni, stainless steel, Cr-steel with 0.08% C and 14% Cr, and "18/8" with 0.07% C, 18% Cr and 7.4% Ni. The testing solutions were alkaline, neutral and acid. The present investigation also includes single potential measurements and more attention was paid to securing a surface absolutely free from a film. On the first passification, optical changes always occurred on homogeneous and heterogeneous mirrors. By means of Drude's equation, the changes were ascertained as being due to a film of 30 A. U. thickness with a reactive index of 3.0. Since this diffraction index largely coincides with that of an oxide, it is highly indicative that the phenomenon of passivity is closely connected with the formation of an oxide film (oxide film theory). The films occurring during the passification treatment could be removed to a more or less complete extent (depending on the solution and kind of steel) by an activation treatment. However, porous oxidic layers (rust) occasionally appeared due to a continuous activation and passification. With reference to the heterogeneity of the highly polished samples, higher current densities were required to produce passivity under otherwise equivalent testing conditions. On heterogeneous mirrors the optical changes produced by passification became reversible to a smaller extent as was the case with homogeneous specimens. The oxide film remained on cementite and double carbide grains. EF (4)

British Report on Deterioration of Marine Structures. *Engineering News-Record,* Vol. 109, July 7, 1932, page 19.

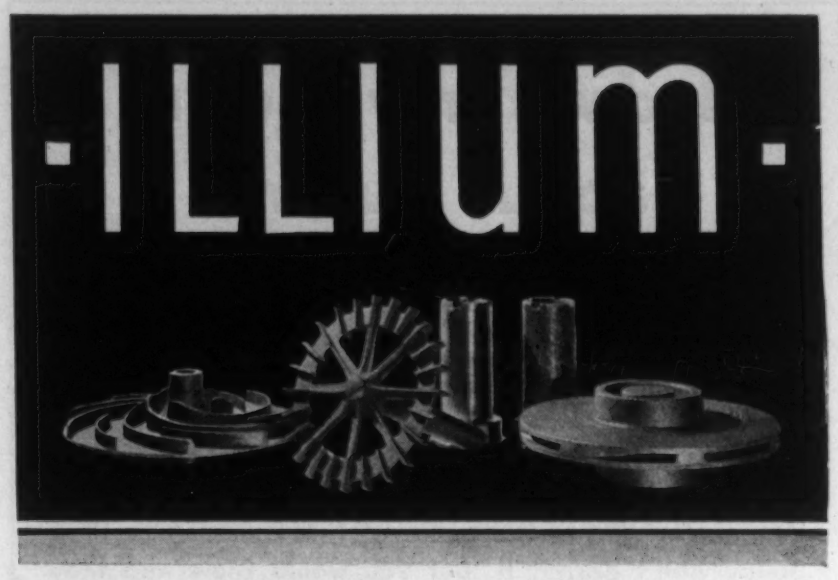
Investigation by committee of British Institution of Civil Engineers on the deterioration of lumber, concrete and metal structures in sea water has been in progress since 1916. Fe and steel specimens were under exposure for 10 and 15 years at Auckland, Halifax, and Plymouth. The 36% Ni steel aerial bars appear in all cases to be in perfect condition, and the aerial bars of 13½% Cr steel appear to be corroded appreciably less than the rest of the metals exposed to air. Specimens placed at half-tide level are generally covered with marine growths, but they reveal differences according to the port of exposure; at Auckland all bars show spots through the barnacles. At Halifax the 13½% Cr steel is in good condition save for pitting at one end, and the Swedish Fe and hot-blast cast Fe appear to be well preserved, while the 36 and 3½% Ni steel and the Armco and Low Moor irons are in fairly good condition. The half-tide bars at Plymouth are heavily incrusted with barnacles, the 2 Ni steels appear to have deteriorated less seriously than the rest. The entirely immersed bars at Auckland are all thickly covered with growths, and rust is appearing on all, but least on the Ni steel and 2 of the wrought irons. The bars immersed at Halifax and Plymouth are also for the most part rusty and covered with marine growth, but the original surface can be seen on the high Ni and Cr steels. CBJ (4)

Corrosion Resisting Nickel Cast Irons. (Les fontes au nickel resistant a la corrosion.) *Revue du Nickel,* Vol. 3, Jan. 1932, pages 21-28.

Ni graphitizes cast irons. With more than 12% Ni cast irons become austenitic and graphitic. The corrosion resistance of such cast irons is of the same order as that of stainless steels. For best properties 3% C is preferable. Addition of small amounts of Cu to austenitic Ni cast irons increases the corrosion resistance in H_2SO_4. Small amounts of Cr are beneficial. Such cast irons are actually in use in the artificial silk industry for parts of machinery that come in contact with H_2SO_4. They are also used in the petroleum and mining industry on account of their low cost and excellent corrosion resistance at high temperatures. AH (4)

Eloxal, the New Corrosion Protection Technique for Aluminum. (Eloxal, die neue Korrosionsschutztechnik für Aluminium.) *Werft, Reederei und Hafen,* Vol. 13, Mar. 1932, page 76.

Calls attention to the new anodic oxidation of Al, designated as Eloxal, and urges adoption of eloxalized Al in ship building. EF (4)



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Patina. (Patina.) CARL RANCKE. *Oberflächentechnik,* Vol. 9, June 7, 1932, pages 111-113.

The natural corrosion of Cu and bronze articles with its artistic effects is discussed and a few methods described to obtain the same effects by artificial means, especially electrolytic treatments. Ha (4)

The Open-Air Corrosion of Copper. Part III.—Artificial Production of Green Patina. W. H. J. VERNON. *Institute of Metals, Advance Copy* No. 619, Sept. 1932, 9 pages.

Artificial coatings produced by chlorides were not stable when exposed to the atmosphere. A basic-sulphate patina can be produced by the action of a 10% solution of $(NH_4)_2SO_4$. In this method the solution is applied twice daily for about 6 days. It is then washed with a 10% solution of $CuSO_4$ containing 1% NaOH and 5% NH_4NO_3. Such a coating begins to peel away during the first period of frost. A stable patina can be produced electrolytically by making the Cu anode in a suitable electrolyte. A good electrolyte contains 10% $MgSO_4$, 2% $Mg(OH)_2$ and 2% $KBrO_3$. The bath is operated at 95° C. The optimum current density is 4 amp./dm.^{2} with the electrodes 1.5″ apart. The treatment is continued for about 15 min. After washing in water the material is ready for service. Exposure tests proved that the patina was stable even under freezing conditions. When formed the coating corresponds to $CuSO_4 \cdot Cu(OH)_2$. Its basicity increases on exposure. Definitely better results were obtained with arsenical Cu, and a material containing 0.45% As was used in the main experiments. Sn(0.8%) and Ni(2.5%) caused inferior coatings. Good patinas were formed on statuary bronze by the electrolytic method. JLG (4)

Corrosion Resistant Lead. (Korrosionsbeständiges Blei.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, July 10, 1932, page 367.

Experiments of the German Dye Trust show that the resistance of Pb to certain chemical attack can be considerably increased by the formation of passive layers. The best effect is obtained when the element added is present not as a eutectic but as a mechanical admixture. By hammering or rolling Ag fillings into the Pb surface, Pb becomes absolutely stable against the attack of hot concentrated H_2SO_4. By alloying Ag to Pb the poor resistivity of pure Pb against hot H_2SO_4 is not improved. GN (4)

Note on the Reaction between Hydrogen Sulfide and Mercury. ARTHUR L. ROBERTS. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1810-1811.

It was found that Hg is immune from attack by H_2S free from air and moisture. MEH (4)

The Effect of Supports on the Catalytic Activity of Nickel. CHARLES R. GLASS & LOUIS KAHLENBERG. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 135-156.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 163. (4)

Silver Alloys of High Corrosion Resistance. (Schweranlaufende Silberlegierungen.) *Deutsche Goldschmiedezeitung,* Vol. 35, Jan. 16, 1932, pages 24-25.

The paper first refers to investigations by Fischbeck in which the resistivity of a large number of Ag alloys was tested in a saturated solution of S in aniline. The 800-835/000 Ag alloys with Zn and Cd have the highest resistance to tarnishing (attack of S). However, these alloys are rather soft. Experiments on improving the mechanical properties by age hardening components are discussed. GN (4)

Two Years' Corrosion Tests with Duralplat in the North Sea. K. L. MEISSNER. *Institute of Metals, Advance Copy* No. 613, Sept. 1932, 11 pages.

Duralplat comprises an alloy equivalent to 17S coated with an Al-rich Al-Mg-Mn alloy more resistant to corrosion than the base alloy. Its strength when properly heat treated is equivalent to that of Duralumin or 17S. Samples of sheets, shapes and riveted structures were exposed. Some were always immersed and some were exposed at ebb and flow tide. Corrosion was estimated from loss in weight, tensile properties and microscopic examination. Attack of the base metal was observed only in the thinnest sheet (0.5 mm.). It was concluded that "Two years' corrosion tests with Duralplat in the North Sea showed the excellent corrosion resistance of the material," and "The life of thicker materials, especially more than 1 mm., is undoubtedly very long. Due to loss of specimens in a storm, tests on the riveted materials extended only over 18 months. The rivets corresponded to the composition of the base material. No rivets were loosened by corrosion. JLG (4)

Determination of Corrosion of Iron, Chromium and Nickel and Corrosion and Heat-Resistant Alloys of These and Other Metals. (Korrosionsbestimmungen an Eisen, Chrom und Nickel, sowie an korrosions- und hitzebeständigen Legierungen dieser und anderer Metalle.) R. MUELLER, G. HAHN & H. KRAINER. *Berg- und Hüttenmännisches Jahrbuch,* Vol. 80, June 10, 1932, pages 74-78.

The electrolysis of melts of fluorides requires heat- and corrosion-resisting materials. The experiments with Fe, Cr and Ni and various alloys showed that in a melt of MgF_2 at 950° C., Fe was the least and Ni the most resisting, with Cr in between; after 6 hours test Fe showed an average loss of 10.3%, Cr, 9.3%, and Ni a very slight increase in weight, due very likely to a thin film formed on the surface. Cr-C steels show at first with increasing C content a deterioration; with higher C content near the eutectic point an improvement takes place. Ni steels show with increasing Ni content an increase in corrosion resistance. Si has a slight improving influence. Cr and Ni increase the resistance considerably, particularly steel with 19% Cr and 40% Ni showed the best values next to pure Ni. An addition of Al seems also to have a favorable effect, the same is true for Mo and Cu; but the replacement of Ni by Co leads to strong corrosion. In general, it could be stated that, under the influence of molten $Mg\text{-}F_2$, pure Ni is the most resistant, highly alloyed Cr-Ni steels are a close second, while the typical heat-resisting C-Si steels are comparatively strongly attacked. The actual loss in material for all tests is tabulated. Ha (4)

STRUCTURE OF METALS & ALLOYS (5)

Metallography & Micrography (5a)

The Microstructure of Hardened Carbon Steel. H. E. PUBLOW & FITZ RANDOLPH. *Michigan State College, Engineering Experiment Station Bulletin* No. 45, Vol. 7, Apr. 1932, pages 1-19.

The theory of Sauveur of the transformation of austenite into martensite is accepted as giving the best explanation, but numerous tests and examinations of structures made at different points along the heating curve and quenching at different temperatures showed discrepancies as sometimes exactly the same structures had absolutely different physical properties and behaved quite differently in their reaction toward etching reagents. It is assumed that there is a chemical as well as a purely physical change that takes place within the critical range of heating which has a bearing upon the hardening properties of the Fe-C alloys. Thermal points in equilibrium diagrams do not always indicate reformation of grains but rather an evolution or absorption of heat which means either a chemical change or a recrystallization or both. If a chemical change takes place it may occur within the C molecule and there may also be a change in the relations existing between C and Fe. The fact that steels which have been quenched at various temperatures within the critical range show pronounced differences in their reaction toward HNO_3 would tend to corroborate the assumption of a chemical change. Ha (5a)

The Relation Between the Hydrogen Overvoltage and Composition of Brass. M. DEKAY THOMPSON. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 115-119.

Includes discussion. See *Metals & Alloys,* Vol. 2, July 1931, page 128. (5a)

The Relation between the Hardness and the Particle Size of Iron-Carbide of Carbon Steels. (Die Abhängigkeit der Härte bei Kohlenstoffstählen von der Teilchengrösse des Eisenkarbids.) SEIJIRO SHIMURA & HANS ESSER. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 2 pages.

See *Metals & Alloys,* Vol. 2, June 1931, page 111. Ha (5a)

Composition Limits of the Alpha-gamma Loop in the Iron-tungsten System. W. P. SYKES. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 307-312.

Includes discussion. See *Metals & Alloys,* Vol. 2, Nov. 1931, page 251. (5a)

The Solubility of Gold in Mercury. III. ARTHUR A. SUNIER & LAW G. WEINER. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1714-1721.

About 50 determinations of the solubility of Au in Hg have been made in the temperature interval 200° to 300° C. with a modified solubility tube and an air-bath. No maximum in the solubility curve is found, the results being confirmed by 6 supplementary runs using the synthetic method. MEH (5a)

The Causes of the Transformation of Austenite into Martensite in the proximity of Room-Temperature. (Ueber die Ursache der Umwandlung des Austenit in Martensit in der Nähe der Raumtemperatur.) ERICH SCHEIL. *Zeitschrift für Elektrochemie,* Vol. 38, July 1932, pages 554-557.

The thermal exchange of places of the atoms to which in most cases the transformation of phases of materials can be ascribed does not explain transformations in polymorphous types of crystals. This is investigated particularly for the transformation of austenite into martensite for which the reason is seen in a stress in the direction of deformation. The influence of the stresses and the grain sizes and grain borders on the transformation is discussed on the basis of experiments. Ha (5a)

Transformational Characteristics of Iron-manganese Alloys. HOWARD SCOTT. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 284-306.

Includes discussion. See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 34. (5a)

The Constitution of the Lead-Tin Alloys. D. STOCKDALE. *Institute of Metals, Advance Copy* No. 617, Sept. 1932, 16 pages.

A microscopic method, 2 thermal methods, and an electrical resistance method were used in determining the solid solubility of Sn in Pb. Other portions of the diagram were studied, but not so elaborately. The solid solubility of Sn in Pb was found to be 19.5% at the eutectic temperature. It fell to 2% or less at room temperatures. No definite conclusion was reached regarding the evolution of heat at 150° C., but it is improbable that it is an allotropic transformation. JLG (5a)

The Transformations of Cobalt, Nickel and Iron. (Ueber die Umwandlungen von Kobalt, Nickel und Eisen.) ALFRED SCHULZE. *Die Giesserei,* Vol. 19, May 13, 1932, pages 187-189; June 10, 1932, pages 226-230.

The transformation of metals is defined as a transition from one modification into another and by a change of properties in spite of the same chemical composition. The transformation is usually connected with a change of the lattice structure which means an allotropic modification. Besides these, there exist 2 transformations closely connected with the magnetic behavior of the metal; these points are called the Curie points; here the ferromagnetic metal loses its ferromagnetism. These transformations were investigated for Co, Ni and Fe. The experiments are described in detail and the changes in the physical properties at the transformation points discussed. Co has an allotropic transformation between 400° and 500° C. and a magnetic transformation at 1128° C., Ni a magnetic transformation at 356° C., Fe a magnetic transformation at 768° C. and 2 allotropic transformations at 906° and 1401° C. The electric resistance and thermoelectric force, thermal expansion, specific heat and heat conductivity show clearly these modifications at the respective points; the behavior at the magnetic transformation points, however, differs from that at the allotropic transformation points. Ha (5a)

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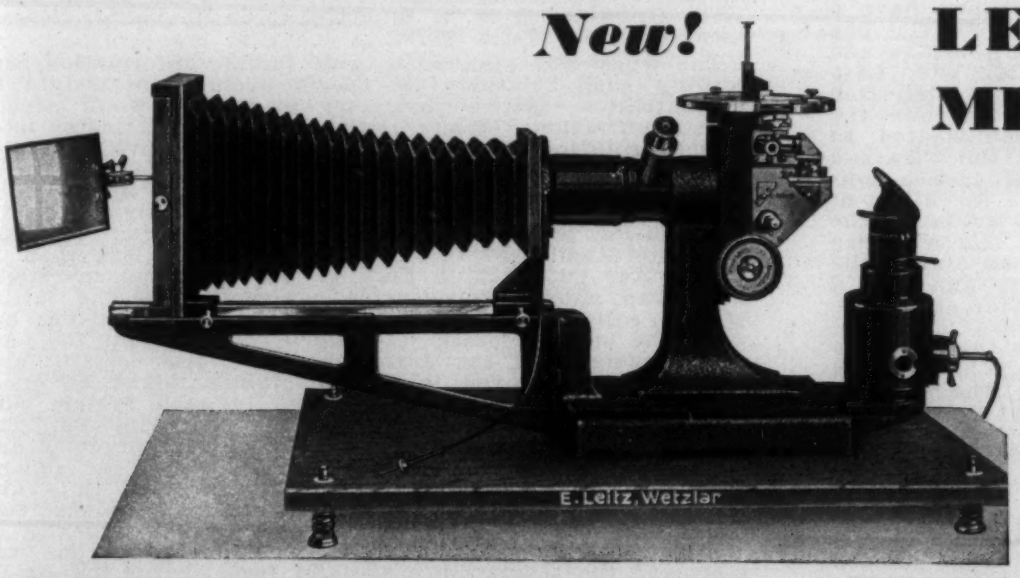

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The Penetration of Filtered Heterogeneous X-rays through Copper, Aluminum and Lead, Determined by Use of Photographic Methods. (Die Durchlässigkeit von Kupfer, Aluminium und Blei für gefilterte heterogene Röntgenstrahlen ermittelt unter Benutzung der photographischen Indikation.) MAX WIDEMANN. *Metallwirtschaft,* Vol. 11, July 8, 1932, pages 383-386.

The penetration of X-rays through metals depends on the atomic number, density and thickness of the metal, and on the shortest wave length of the X-ray spectrum. The formulas showing these relationships are developed. From numerous tests on Cu, Al and Pb the values for b = milliamp-sec. necessary to produce a .7 blackening effect on the photographic film for various thicknesses of metal and using from 60 to 200 kv. were determined. These values are plotted in the form of graphs. A blackening effect of .7 was chosen because in this range a contrast as small as .005 can be detected by the eye in diffused daylight. If the object being examined is of very irregular shape 2 or more radiographs should be taken with b values corresponding to the various thicknesses. It is better to overexpose than to underexpose. Knowledge of the b values can be used for the choice of the best suited exposure time for a radiograph, for the determination of the smallest discernible difference in thickness, for the comparison of the efficiency of 2 X-ray tubes and for the determination of the rate of penetration. 7 references. CEM (5b)

Texture of Metals after Cold Deformation. FRANZ WEVER. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 51-77.

Includes discussion. See *Metals & Alloys,* Vol. 2, May 1931, page 98. (5b)

Exploration of the Internal Structure of Matter Through Radio-activity. (Die Erforschung der innersten Struktur der Materie durch die Radioaktivität.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 22, 1932, pages 274-276.

This is a summarizing report on the following 3 papers, presented before the 37th annual meeting of the Deutschen Bunsengesellschaft für angewandte physikalische Chemie, May 16-19, 1932 at Münster. H. Geiger: The Importance of the α- Rays for the Investigation of the Atom; L. Meitner, The Importance of the β- and γ- Rays for the Investigation of the Atom; F. Paneth: Isotopy. GN (5b)

The Hyperfine Structure of Lead. JOHN L. ROSE & L. P. GRANATH. *Physical Review,* Vol. 40, June 1932, pages 760-778.

The hyperfine structure of several lines of Pb I and Pb II in the violet and ultra-violet regions have been determined. WAT (5b)

Is there a Compound Al_2Zn_3? (Gibt es eine Verbindung Al_2Zn_3?) M. v. SCHWARZ & O. SUMMA. *Metallwirtschaft,* Vol. 11, July 1, 1932, pages 369-371.

Other investigators using micrographic and thermo-analytical methods have claimed that the compound Al_2Zn_3 containing 21.3% Al and 78.7% Zn exists. However, the reported concentration and temperature zones differ. The authors found that alloys containing 10 to 50% Al with and without small Mg and Cd additions have a definite arrest in their heating curves at 290°C. The cooling curves indicate the decomposition of β into γ and α phases. A wire containing 21.3% Al, .1% Mg and 78.6% Zn was examined by X-rays. The Debye diagram indicated a hexagonal arrangement similar to pure Zn, but the strongest Al lines were also visible. When heated to 350°C. for 60 min. and quenched in ice water the wire had a face centred cubic lattice with a 3.978 A.U. lattice constant, while that of pure Al is 4.043 A.U. An alloy of 25% Zn and 75% Al, which is beyond the limits of the γ solid solution, heat treated the same way had a lattice constant of 4.030 A.U., and a 50% Zn alloy had almost the same constant. The constants of the phase and the β solid solution can easily be distinguished. After aging the quenched 21.3% Al alloy at room temperature it gradually assumes a hexagonal arrangement while the intensity of the cubic lattice becomes less. This change is hastened by heating up to 350°C. and cooling slowly. The β phase decomposes. Calculating from the specific weight, the molecular weight and the lattice constant the compound Al_2Zn_3 would have .79 molecules per lattice cell, which deviates considerably from a whole number. Assuming a substitution solid solution the result is 3.96 or practically 4. The authors conclude that there are 2 electron arrangements. In one the valence electron is attached to the nucleus and the atom becomes elliptical and leans toward an hexagonal arrangement. In the other the valence electron is loosely connected with the nucleus, the atom is spherical and leans toward a cubic arrangement. The proportion of the 2 kinds of electron arrangements depends on the temperature and the development of the hexagonal or the cubic symmetry takes time. This also explains the great instability of the β phase at low temperatures. 12 references. CEM (5b)

X-Ray Study of the Copper End of the Copper-Silver System. CYRIL STANLEY SMITH. *Industrial & Engineering Chemistry,* Vol. 23, Aug. 1931, pages 969-970.

A dispute of Roy W. Drier's conclusions on the insolubility of Ag in Cu as determined by X-ray study. Reply by Roy W. Drier. MEH (5b)

Three Crystalline Modifications of Electrolytic Chromium. KUMAZO SASAKI & SINKITI SEKITO. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 437-444.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 169. (5b)

Suppressed Constitutional Changes in Alloys. G. SACHS. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 39-50.

Includes discussion. See *Metals & Alloys,* Vol. 2, June 1931, page 111. (5b)

Poly-plumbites, Poly-stannides and their Transition into Metal Phases. II. Communication on Metals and Alloys. (Polyplumbide, Polystannide und ihr Uebergang in Metallphasen. II. Mitteilung über Metalle und Legierungen.) E. ZINTL & A. HARDER. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 154, Jan. 1931, pages 47-91.

In the otherwise purely chemical research work on poly-plumbides and poly-stannides, the binary system Na-Pb is investigated by X-rays between 0 and 50 atomic % Na. Three phases α, β and γ occur. The space lattice constant of Pb was found to be 4.943 A.U. An alloy with 2.2 atomic % Na yielded the diagram of pure Pb with slightly enlarged glancing angles indicating a space lattice contraction during the formation of a solid solution of Pb with Na. The parameter of the α phase, which is saturated with Na at a concentration of 15.3 atomic %, amounts to 4.932 A.U. The space lattice contraction phenomenon is considered to be closely connected with the hardening effect of alkalies and alkaline earth metals on Pb. There are 4 atoms in the cubic elementary cell of the β phase. The cube length is 4.873 A.U. In contradiction to C. A. Mathewson, the investigators deny the existence of an intermetallic compound in the β range of homogeneity. The first lines of the γ phase appear at a concentration of 34.9 atomic % Na. EF (5b)

The Atomic Structure of NaTl and its Relationship to Structures of the Beta Brass Type. IV Communication on Metals and Alloys. (Über den Gitterbau von NaTl und seine Beziehungen zu den Strukturen vom Typus des beta-Messings. 4. Mitteilung über Metalle und Legierungen.) E. ZINTL & W. DULLENKOPF. *Zeitschrift für physikalische Chemie,* Abt. B, Vol. 16, Mar. 1932, pages 195-205.

Powder photograms of NaTl revealed a cubic atomic arrangement with a = 7.473 A.U. and 8 atoms of Na and Tl to the elementary body. The radius of Tl in NaTl is 1.62 A.U. which is in agreement with Goldschmidt's findings. The Na atoms in NaTl are 13% smaller than in the pure element Na. In structural regard, NaCl is related to the body centered alloy phases of the β brass type. The influence of polarization, of the ratio of sizes of the atoms, and of the average number of valence electrons per atom on the manner of distribution of 2 kinds of atoms in a lattice arrangement is discussed. The law of Hume-Rothery-Westgren & Phragmén correlating the structural type to the average number of valence electrons per atom does not hold true for alloys containing very base metals. EF (5b)

Cemented Tungsten Carbide; a Study of the Action of the Cementing Material. L. L. WYMAN & F. C. KELLEY. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 208-229.

Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 908. (5b)

The Lattice Constants of Silver-Palladium and Gold-Palladium Alloys (Die Gitter Konstanten der Silber-Palladium und Gold-Palladium legierungen.) W. STENZEL & J. WEERTS. Festschrift zum Fünfzigjährigen Bestehen der Platinschmetze (1881-1931). G. Siebert, G. m. b. H. Publisher, G. M. Alberti's Hofbuchhandlung, Hanau. Pages 288-299.

The work was planned to give further information concerning such relations as: specific volume to weight % concentration; lattice parameter to volume % or atomic % concentration; atomic radii to lattice parameter, etc., of solid solutions of alloys. The results of previous studies on these relations are reviewed. To test Vegard's principle that the parameters of solid solutions are additive functions of the atomic % concentrations, alloys of Ag-Pd and Au-Pd were studied—by precision X-ray methods. The interatomic distance in Pd like Pt is less than in Au or Ag, but greater than in Cu. Previous investigations had shown considerable contraction in the lattice of the solid solutions of both Ag-Pd and Au-Pd, but when the more recently determined constants for the pure metals were used the deviations were less certain; also the method employed in earlier studies might be questioned. The authors studied alloys in each system containing approximately 5, 20, 50, 80, and 95% Pd. The specimens used for the X-ray tests with a simplified and improved equipment were 0.4 mm. thick and 1 cm. square. Specimens of each composition were annealed in 4 different ways: (1) annealed in high vacuum; (2) reduced 50% by rolling and annealed in pure argon; (3) annealed in air, and (4) annealed in argon. The annealing time was 1 hr. and the temperature 920 and 1000° C. for the Ag-Pd and Au-Pd alloys respectively. The lattice constants used for Ag and Au, 4.077 and 4.070 A.U., were those previously determined by Sachs and Weerts, while the value for Pd was redetermined as 3.8809, which was in rather good agreement with 3.879 previously reported by Bredig and Allalio. No consistent relation was found between the heat treatments and the resulting parameters, and the values plotted are averages of 4 or 5 determinations. For the Au-Pd alloys the lattice constant varied practically as a linear function of the atomic % concentration. For the Ag-Pd alloys a slight contraction was found, which for the 50 atomic % alloy amounted to about .007 A. U., or about 0.2%. OEH (5b)

Solid Cadmium Amalgams An X-Ray Proof of the Compound Cd_3Hg. NELSON W. TAYLOR. *Journal American Chemical Society,* Vol. 54, July 1932, pages 2713-2720.

X-ray examination of solid Cd amalgams, which had been annealed in vacuo at 147° for 72 hours, has demonstrated the existence of a new crystal phase, body-centered tetragonal. The composition range includes 70 and 75 atomic % Cd, and may be slightly wider. It may be regarded as Cd_3Hg or as a solid solution of Hg in Cd_3Hg. MEH (5b)

X-Ray Examination of Airplane Parts. (Röntgenuntersuchungen von Flugzeugbauteilen bei der Deutschen Versuchsanstalt für Luftfahrt.) KURT MATTHAES. *Zeitschrift für Flugwesen und Motorluftschiffahrt,* Vol. 23, July 28, 1932, pages 459-464.

The paper first describes the X-ray equipment installed at the Deutsche Versuchsanstalt für Luftfahrt 2 years ago. The result of practical tests on cast and welded airplane parts are then reported. Among others spot welded parts of Al alloys and Cr-Ni steel were examined. The examples show that X-rays are most suitable for examining cast and welded finished airplane parts. GN (5b)

X-Ray Examination of Large Chemical Equipment. (Röntgenuntersuchungen an chemischen Grossapparaturen.) W. BUSSE. *Die Chemische Fabrik,* June 1, 1932, pages 185-188.

In the examination of metals, particularly castings and welded metals, for porosity or other defects by the X-ray method, the voltage used should not be greater than necessary for the rays to penetrate in the required time. Otherwise the contrast will be reduced. Tables are given showing the required voltage for various lengths of exposure and various thicknesses of Fe, Al and Cu. The efficiency of detecting defects decreases as the thickness of the metal being examined increases and varies with different metals. The principles of the X-ray diffraction method are explained, including the Debye-Scherrer method. It is useful for the identification of small samples, the examination of structure changes and the study of crystal structure and orientation. CEM (5b)

Convergence Patterns as a Method for Making Layer Line Diagrams in a short Time. (Konvergenzaufnahmen als Verfahren zur Herstellung von Schichtliniendiagramen in besonders kurzer Zeit.) O. KRATKY. *Zeitschrift für Kristallographie,* Vol. 82, No. 1/2, 1932, pages 152-154.

For taking layer line diagrams on macroscopic crystals a camera was constructed which gives patterns in ⅓-⅛ of the time that is necessary in using the common revolving-crystal method. It is essential to use a pencil of X-rays which possesses a large convergence in the plane vertical to the translation period to be determined. During the exposure the crystal is fixed but rotated around the camera axis during that time 1-3 times. GN (5b)

The Relation between Deformation Structure and Recrystallization Structure of Aluminum. (Über den Zusammenhang zwischen Deformations-und Bearbeitungs-Rekristallisationstextur bei Aluminium.) W. G. BURGERS. *Metallwirtschaft,* Vol. 11, Apr. 29, 1932, pages 251-255; May 6, 1932, pages 265-267.

20 references. A cylindrical disk was carefully turned from an Al single crystal and was compressed in many steps, each with a smaller increase in pressure. Laué photographs were taken before and after deformation, also after recrystallizing by heating to 600° C. for several seconds, and pole figures were constructed. It was found that the orientation of the crystallites during recrystallization results from theoretical position of the crystal before annealing by turning about an axis perpendicular to the direction of slip. Only those lattice sections near the ends of the local slip planes which are deflected the most are suitable for the formation of nuclei. The relation between deformation structure and recrystallization structure of single or coarse crystals compressed irregularly is similar to that of those compressed homogeneously. In finely crystalline Al the conditions are different and the deformation and recrystallization structures are identical. All crystallites are equally stressed during compression and are equally suitable for the formation of nuclei during recrystallization. In some cases the recrystallization structure is more distinct than the deformation structure. CEM (5b)

Principles of Material Testing with Gamma-Rays. (Grundlagen der Werkstoffprüfung mit Gammastrahlen.) R. BERTHOLD & N. RIEHL. *Zeitschrift Verein Deutscher Ingenieure,* Vol. 76, Apr. 23, 1932, pages 401-406.

The possibilities of using the γ-radiation of radio-active elements for the testing of materials instead of X-rays are described; while the latter have a wave length of 1×10^{-7} to 5×10^{-10}, γ-rays have a wave length of 5×10^{-10} to 5×10^{-11}. The different sources of γ-radiations are described and, as a practical material, mesothorium can be used instead of the more expensive radium. The half-time value of Ra is 1700 years, that of mesothorium 26 years. The method of application of the preparations are explained; the tests permitted drawing the following conclusions: X-rays are at present suitable only for the irradiation of great thicknesses (steel of more than 50 mm. thick); the small radio-active preparations can easily and conveniently be placed even in fairly inaccessible parts; practically no supervision is required during exposure; the times of exposure are considerably longer for the testing of small or medium thickness (less than 100 mm.) than with X-rays of about 200 kv.; defects are less clearly seen than with X-rays, and luminescent screens cannot be used due to the low intensity of the radiation. As an example, with a mesothorium preparation of 30 mg. (value about 5000 Mk.) a steel of 150 mm. thickness could be photographed at 50 cm. distance from the plate in 40 hours, 100 mm. in 25 hours. Ha (5b)

Application of X-rays in the Manufacture of Telephone Apparatus. M. BAEYERTZ. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 162-175.

Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 907. (5b)

Laws between alpha- and beta-Decomposition Constants. (Über Regelmässigkeiten zwischen alpha-und beta-Zerfallskonstanten.) J. KUDAR. *Die Naturwissenschaften,* Vol. 20, Jan. 1, 1932, pages 84-85.

The author confirms that in decomposing radio-active series, 2 successive β transformations and the following or preceding α transformation can be considered as a periodical phenomenon. The laws governing these triadic cycles are given with reference to the uranium, thorium and actinium series. Their life times are computed yielding a value which is practically constant in spite of the considerable fluctuations of the individual τ values. EF (5b)

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Effect of Illumination on Value of Brinell Ball Indentation. (Einfluss der Beleuchtung bei Ausmessung von Brinell-Kugeleindrücken.) HANS ESSER & HEINZ CORNELIUS. *Stahl und Eisen,* Vol. 52, May 1932, pages 495-496.

In examination of Brinell hardness of electrolytic Cu, electrolytic Fe, and austenitic steel, it was observed that the direction of illumination on the ball indentation could give varying diameter and consequently different Brinell hardness. Deviations in results between lighting perpendicular, inclined and parallel or dark to testing point, amounted to approximately -6.5%. For accurate measurement of ball indentation diameter a dark background is the most suitable. This agrees with work of H. O'Neill, who detected variations of from -6 to -9% with vertical illumination. DTR (6)

Investigations of Weld Seams with the Filings Testing Method. (Untersuchungen von Schweissnähten mit dem Feilspäneprüfverfahren.) EBEL & STEPF. *Zeitschrift des bayerischen Revisionsvereins,* Vol. 36, June 15, 1932, pages 125-127.

The investigations were carried out on the weld seams of 2 boiler drums. The seam is dusted with filings and magnetized. A uniform saturation of the part to be tested with the magnetic flux is of importance for the result. Unless this is guaranteed no reliable conclusions are to be drawn on the quality of the seam. The results to date indicate that the method, when further improved, will become a useful tool for testing weld seams, at least water gas welds. It was shown that failures near the surface can be detected with greatest reliability. Indications are that also internal defects will be detected when very fine file dust is used. GN (6)

Confused Definitions in Material Testing. (Unklare Begriffsfestlegung bei der Werkstoff-Beurteilung.) H. HORNAUER. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, Aug. 10, 1932, page 89.

The paper discusses the definition of toughness and brittleness and the Austrian and Swiss proposals for accurate definition. GN (6)

Remarks on the New Theory of Buckling. (Bemerkungen zur neuen Knicktheorie.) F. HARTMANN. *Zeitschrift des Österreichischen Ingenieur- und Architektenvereins,* Vol. 84, Apr. 8, 1932, pages 68-69.

Remarks on the publication by W. Rein: Versuche zur Ermittlung der Knickspannungen für verschiedene Baustähle: (Berichte des Ausschusses für Versuche im Stahlbau, Report Nr. 4.) Hartmann rejects the new theory of buckling stresses advanced by Rein. See also: L. Ilosvar, *Montanistische Rundschau,* Vol. 24, Feb. 16, 1932, pages 15-16. GN (6)

On Buckling Theories and Buckling Stresses. (Ueber Knicktheorien und Knickversuche.) MICHAEL BROSZKO. *Zeitschrift des Oesterreichischen Ingenieur-und Architektenvereins,* Vol. 84, Aug. 12, 1932, pages 163-165. FRIEDRICH HARTMANN. Aug. 12, 1932, pages 165-166.

Discussion between the 2 authors on Hartmann's rejection of the new theory of buckling stresses advanced by Rein. See *Zeitschrift des Oesterreichischen Ingenieur-und Architektenvereins,* Vol. 84, Apr. 8, 1932, pages 68-69. See also *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 242. GN (6)

Aging Notch-Toughness and Etching of Force-Effect Figures. (Alterungskerbzähigkeit und Kraftwirkungsfiguren-Aetzung.) H. JUNGBLUTH. *Archiv für Eisenhüttenwesen,* Vol. 4, May 1931, pages 533-535.

See *Metals & Alloys,* Vol. 2, Oct. 1931, page 214. (6)

Construction, Operation and Material Testing. (Konstruktion, Betrieb und Werkstoffprüfung.) H. HORNAUER. *Maschinenkonstrukteur- Betriebstechnik,* Vol. 65, May 10, 1932, pages 52-53.

The paper stresses the importance of the fatigue limit, the creep limit and notch toughness for the constructor. GN (6)

On the Effect of "Self-aid" of Structural Steel in Frame-like Girders. (Über die Auswirkung der "Selbsthilfe" des Baustahls in rahmenartigen Stabwerken.) KARL GIRKMANN. *Stahlbau,* Vol. 5, Aug. 5, 1932, pages 121-127.

The capacity of plastic deformation of a steel and its effects on girders that are subjected to bending and normal stresses is investigated. A method for dimensioning frame-like girder constructions is developed. The results of practical tests are discussed. 5 references. GN (6)

Progress in the Field of Optical Stress Investigation of Structures. (Fortschritte auf dem Gebiet der spannungsoptischen Untersuchung von Konstruktionen.) LUDWIG FOEPPL. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, May 21, 1932, pages 505-508.

The principles of the optical investigation of tensile stresses are explained using the equipment of the laboratory at the Munich University and the different methods of use discussed when experimenting with different materials; flint glass, celluloid, bakelite and phenolite are most frequently used; the latter 2 however offer the drawback of having interior stresses while glass does not. The application to metals of results found in testing such material is permissible as the values of the elastic constants and the Poisson constant are without influence on the state of stress. Exceptions are discussed. 13 references. Ha (6)

Ratio of Strain and Strength of Materials Hypothesis. (Anstrengungsverhältnis und Festigkeitshypothese.) M. ENSSLIN. *Ingenieurarchiv,* Vol. 2, 1931, pages 372-377; K. LACHMANN. *Ingenieurarchiv,* Vol. 2, 1931, pages 378-380.

Discussion between the 2 authors on a former paper by K. Lachmann on the same subject. (*Ingenieurarchiv,* Vol. 1, 1930, page 293.) GN (6)

Hardness Changed by Magnetism. E. G. HERBERT. *Metal Progress,* Vol. 21, Apr. 1932, pages 52-56.

The author describes research showing that the rotation of hardened steel in an electromagnetic field produces orderly fluctuations in hardness during a 24 hour period subsequent to the treatment. As an example a specimen of 18% W steel 650 Brinell hard was treated electromagnetically at 610° F. and aged at 70° F. reached a minimum hardness of 575 Brinell 3 hours and 30 minutes later and attained a maximum of 725 Brinell at 14 hours. Similar variations were observed in duralumin. From a series of such investigations the author concludes that hardness changes are in part due to variations in atomic structure. WLC (6)

On the Elastic Aging of Metal Wires. (Über das elastische Altern von Metallfäden.) G. FANSELAN. *Zeitschrift für Geophysik.* Vol. 8, No. 5, 1932, pages 226-232.

The elastic aging was studied on a brass wire (diam: .06 mm., length 45 cm., load: about 70 g.) The temporal course of elastic aging shows an exponential function with a definite dependence on the temperature. After 3 years the elastic disturbance seems to be completed. GN (6)

Comparison of Methods for Determination of Internal Stresses in Complete Cylinders. (Vergleich der Verfahren zur Bestimmung von Eigenspannungen im Vollzylindern.) HERBERT BUCHHOLTZ & HANS BÜHLER. *Stahl und Eisen,* Vol. 52, May 19, 1932, pages 490-492.

On basis of theory and practical measurements, a comparison was made of internal stresses in steel cylinders between drill method and the band method. Heyn and Bauer's drill method gives the total longitudinal, tangential, and radial stresses throughout the specimen but with the band method it is possible to obtain existing stresses only in one main direction. The drill method is the method absolutely to be used, while irregularities enter into the other method. The latter method does not give sufficient data and is entirely too irregular with highly stressed materials. DTR (6)

Influence of A.C. Magnetization on the Energy Absorption in Metals under Torsional Vibrations. (Einfluss der Wechselstrom- Magnetisierung auf die Werkstoffdämpfung bei Drehschwingungen.) A. ESAU & H. KORTUM. *Forschung auf dem Gebiete des Ingenieurwesens,* Vol. 3, May/June 1932, pages 144-150.

In continuing a former investigation on the effect of d.c. magnetization on the energy absorption of metals, the author examined the effects of a.c. magnetization. The testing arrangement is described. Tests were performed on wrought Fe, electrolytic Fe, rolled steel, alloy steel, Ni and a Ni-Fe alloy. The principal results are: (1) In most cases the effect of a.c. magnetization is still larger than that of d.c. magnetization. (2) All materials investigated show qualitatively the same behavior. The energy absorption in relation to the field strength shows a maximum at a relatively small field strength and decreases later. (3) The maximum increase of energy absorption is found at frequencies that are somewhat smaller than the mechanical natural frequency. (4) For small deformations the increase of energy absorption is many times larger than with large deformations. (5) The decrease of energy absorption for soft Fe and steel under the effect of a.c. is found at higher field strengths than under the effect of d.c. magnetization. (6) Alloy steels and Ni show a negative energy absorption within a certain range of the magnetization frequencies and for strong magnetization. (7) No relation was found between the behavior in the d.c. and a.c. field. (8) The frequency changes under the effect of a.c. magnetization were measured for electrolytic Fe, rolled C steel and alloy steel. These changes do not surpass the limit of error, i.e. they are smaller than .5% and .2% respectively. GN (6)

The Effect of the Size of Specimen on the Strength and Elastic Properties of Cast Iron. A. H. DIERKER. *Engineering Experiment Station Bulletin* No. 72, *Ohio State University Studies,* Engineering Series, Vol. 1, No. 4, Part 3, July 1932, 16 pages.

Dierker objects to the arbitration bar, or to specimens cut from a casting and advocates testing the whole section of a casting in the size in which it is made. An iron of 3.00-3.20 total C, 1.80 Si, 0.12 P, 0.04 S, 0.52-0.62 Mn was cast into a 4" x 4" square bar and into a 1.2" diam. arbitration bar, both cast in green sand. Tensile data were concordant, but Charpy impact, on a double width, V-notch specimen, was 1.8 ft. lbs. on the arbitration bar and 3.3 to 4.1 on the 4" x 4". Similar tests on a 3.56 T.C., 0.178 Si, 0.16 P, 0.04 S, 0.60 Mn iron gave 2.5 ft.-lbs. for the arbitration bar and 3.0 to 3.4 on the 4" x 4". The softest and coarsest specimens gave the best impact values. From micrographs it is concluded that the presence of ferrite is probably desirable for impact resistance. The second iron was tested in smaller sizes than 4" x 4" and tensile stress-strain curves plotted, showing the usual type of results. HWG (6)

The Thermoelectric Properties of Ferromagnetic Substances. L. F. BATES. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Ser. 7, Vol. 13, Feb. 1932, pages 393-412.

Theoretical work. Experiments made on the thermoelectric properties of short rods of manganese arsenide. Marked changes occur when the substance passes from the ferromagnetic to the paramagnetic state some specimens showing positive and some negative Thomson coefficients. RHP (6)

Determination of Smoothness of Machine Parts. (Bestimmung der Glätte an Maschinenteilen.) ERNST FRANKE. *Oberflächentechnik,* Vol. 9, June 21, 1932, pages 125-127.

The importance of smooth surfaces for certain machinery parts, such as axles, sliding faces, etc. is pointed out; the friction coefficient is reduced and the wear resistance increased. The means for determining the degree of smoothness are reviewed. This can be done, according to a French patent No. 687424, by a light ray directed against the surface to be examined; the reflected ray is then thrown on a photoelectric cell in which a current proportional to the reflected light is produced which can be measured by an instrument. Another method (German patent No. 544330) uses a disk which rolls along the surface to be tested and on the circumference of which one end of a spiral (watch-) spring slides. The roughnesses on the sample cause the spring to be wound more or less and the small movements can again be indicated by a dial. Another method uses a pendulum, the number of oscillations occurring before it comes to rest is taken as a measure of the smoothness; this method is suitable for round bodies. The results can be graphically represented. Ha (6)

Test Results and Service Values of Materials. H. F. MOORE. *Heat Treating & Forging,* Vol. 18, Apr. 1932, pages 245-247.

From a paper read before a joint meeting of the American Society for Testing Materials and the American Institute of Mining & Metallurgical Engineers, Feb. 1932. See *Metals & Alloys,* Vol. 3, June 1932, page MA 169. MS (6)

Fatigue of Metals & Alloys (6f)

The abstracts appearing under this heading are prepared in coöperation with the A.S.T.M. Research Committee on Fatigue of Metals.

The Endurance Strength of Welded Joints. (Die Dauerfestigkeit von Schweissverbindungen.) W. HOFFMANN. *Elektroschweissung,* Vol. 3, Apr. 1932, pages 65-67.

Paper before Fachausschuss für Schweisstechnik, June 27, 1931 at Köln. The author summarizes and reviews recent investigations of the fatigue limit of welded joints. The principal conclusions are: The static tensile strength is of extreme importance for the endurance properties of all types of welded joints. In fusion welding the filling material must be so chosen that an increase of the elongation does not impair the tensile strength and hardness. In gas welding the tensile strength of the weld should always amount to 100% of that of the base metal. This value must be attained with regard to the fatigue strength of the weld. In arc welding filling materials should be avoided that may cause red shortness of the seam. Also filling materials are to be eliminated that, due to an infiltration of nitrogen, may cause brittleness or tend to age-hardening. Welds with such materials show a low fatigue limit. 8 references. GN (6f)

Increasing the Endurance Strength in Round Specimens with Transverse Holes. (Steigerung der Dauerfestigkeit bei Rundstäben mit Querbohrungen.) A. THUM & H. OSCHATZ. *Forschung auf dem Gebiete des Ingenieurwesens,* Vol. 3, Mar.-Apr. 1932, pages 87-93.

Notch effect of transverse bored holes is explained by the disorder of the stress lines around the hole. The rim of the hole is greatly endangered due to the concentration of stress lines there. The varied notch effect of large holes is determined in fatigue tests, and their dependence is based on the ratio of the diameter of the bore to the specimen. Larger bores have smaller notch effect, smaller bores, greater. From the ratio $d/D = 0.15$ down, the notch effect of small bores increases. To increase the fatigue strength, 3 methods were investigated experimentally: (1) With an additional bored hole, necessarily placed at an angle of 90° (cross-bore), the resistance moment is equalized in rotating the direction of loading, and the fatigue strength of the specimen increased about 4.5%. (2) The strain lines may be led away from the rim of the hole by additional tangential notches so that an increase of endurance limit of 12% is obtained. (3) By setting up internal stresses the endangered points of stress at the opening of the hole can either be increased or decreased according to the location of the system. Corresponding increases of endurance limit up to 34% or decreases around 19% are obtained. Tests with impact loading confirm the influence of internal stresses upon the endurance strength. An increase of about 60% in the work of impact in the endurance test could be established, and for control a desired decrease around 40%. The tests have shown that it is possible in almost all cases to meet the danger of fatigue fracture in bored axles and shafts effectively and practically. It is hoped that undesirable effect of notches of other shapes can be reduced in a similar way. MAB (6f)

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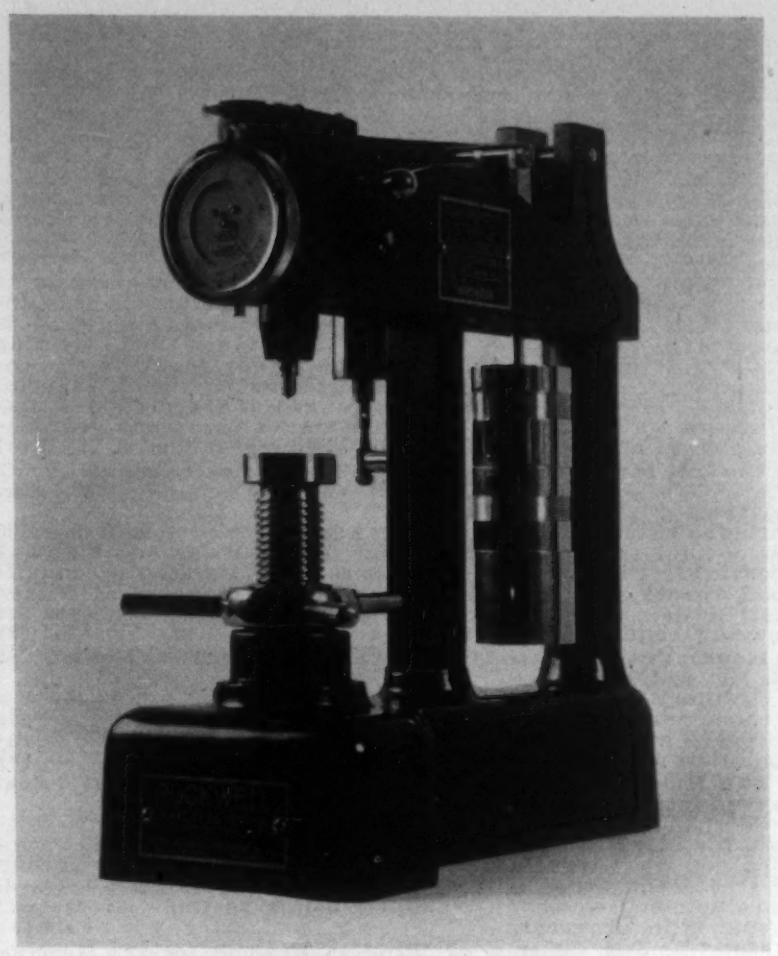

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INDUSTRIAL USES & APPLICATIONS (9)

Replacements of Castings with Welded Steel Plate. G. D. Spackman. *Welding News,* Vol. 3, Jan.-Mar. 1932, pages 1-2.

A great number of broken castings were replaced by welded structural parts. Besides, it is pointed out that with proper design, castings can from the beginning be well replaced by welded parts. See also *Metals & Alloys,* Vol. 3, Mar. 1932, page MA71. Ha (9)

Use of Silver and Gold Plate for Structural Apparatus for the Chemical Industry. (Utilisation des Plaques d'Argent et d'Or pour la Confection d'Appareils Employés dans l'Industrie Chimique.) Ch. Ziegler. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 220-221.

In some cases it is necessary to use precious metals to protect apparatus from certain chemical attacks. This incurs a great and non-productive investment. Since it is necessary to combine strength, resistance and wearing ability to counteract this cost, the author suggests the application of an intermediate layer between the base metal and the plate to reinforce the strength of the plate and also to make soldering feasible. This makes the plate very applicable to many branches of the chemical industry. MAB (9)

Design for Casing Pipe for Pipe Undercrossings. M. G. Spangler. *Engineering News-Record,* Vol. 108, Apr. 27, 1932, pages 580-581.

Rapid extension of oil and gas lines required new specifications for the design of pipe for both railway and highway crossings. Calculations were based on Marston's conduit-load theory and the Boussinesq law of concentrated load distribution. A convenient tabulation of pipe thicknesses for varying conditions is included. CBJ (9)

House Frame Entirely Arc-Welded. *Sheet Metal Worker,* Vol. 23, Jan. 8, 1932, pages 6-7, 10.

Ordinary structural steel shapes were used for building a 7-room house and treated like wood lumber; the costs were only $24 higher than for a wood frame. The details of construction are illustrated. Ha (9)

Non-Rusting Steels a Possibility for Vehicle Construction. *Transit Journal,* Vol. 76, May 1932, pages 229-231.

Corrosion-resisting alloys of Cr, Ni and Fe are found suitable for ultra-light-weight structures. The properties, structure and heat treating possibilities of the usual 18-8 group of steels and other corrosion-resisting alloys are discussed. Development work on vehicles using sections of welded sheets is in progress. CBJ (9)

Molding and Casting of Window Frames for the German Federal Railway. (Formen und Giessen von Fensterleisten für die Reichsbahn.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 145-147.

Detailed discussion of molding practice, composition and casting of window frames as they are used by the German Federal Railway System. GN (9)

The Manufacture of Phonograph Records. R. A. Dimon. *Monthly Review, American Electroplaters Society,* Vol. 19, Jan. 1932, pages 7-16.

Includes discussion. Paper before Philadelphia Branch Annual Meeting, Nov. 21, 1931. The author describes in detail the making of a wax disc upon which the original sound record is made, the first Cu master matrix, the master metal mold and the pressing matrices. The last 3 items are made by electrodeposition which reproduces the sound waves in the wax disc. Both Ni and Cu sulphate plating baths are used, but no bath compositions are given. LCP (9)

Aluminum Conductors for High-Capacity Electric Circuits. F. R. Dallye. *Power,* Vol. 75, May 10, 1932, pages 685-687.

The use of Al conductors in the form of flat bars, tubing and structural shapes for bus connections is described. AHE (9)

Large Pipe, Strong Steel, 100% Joints Have a Profound Effect on Industry. G. O. Carter. *Metal Progress,* Vol. 21, May 1932, pages 34-39.

In the construction of pipe lines over half the cost is steel. The author traces the development of better methods of making pipe and the production of pipe from stronger steel. A profound change in the pipe line industry has occurred with the introduction of sound pipe and welds of strong material enabling the industry to transport over 4 times as much gas per lb. of steel pipe as was possible 10 years ago. A 0.35% C, 1.50% Mn steel, seamless pipe, and improved welding technique have made this possible. WLC (9)

Arc Welding in Structural Steelwork on the New Zealand Railways. Eugene Casey & P. B. Bryden. *Welder,* Vol. 3, May 1932, pages 21-33.

A few examples of welded railroad bridges are described. Ha (9)

The Design, Materials and Erection of The Kill Van Kull (Bayonne) Arch. Leon S. Moisseiff. *Journal Franklin Institute,* Vol. 213, May 1932, pages 465-502.

Excellent discussion and study of use of C, Si, and high alloy steels in this bridge design and construction. Gives physical properties, including rivet shear tests, stress-strain curves. Includes 31 figures. DTR (9)

Stainless Vs. Chrome Plate. J. G. Mapes. *Metal Progress,* Vol. 21, Mar. 1932, pages 43-46.

Except for the Ford organization, the concensus of opinion among automotive manufacturers is that the high cost of purchasing and working stainless steel counteracts the advantages of long life. WLC (9)

Aluminum Pipes in Gas Installations. (Aluminiumrohre in der Gasinstallation.) *Aluminium,* Vol. 14, Apr. 30, 1932, pages 2-3.

Al pipes and fixtures are well suited for domestic plumbing and industrial piping installations, but a protective coating of shellac, asphalt or by oxidation of the surface for which a few recipes are given should be applied. Special tools for Al pipes and their fixtures are being developed. Ha (9)

Cast Steel Foundations for Railroad Equipment. Wm. M. Sheehan. *Steel Founder,* Vol. 3, Mar.-Apr. 1932, pages 39-42.

This installment brings descriptions of large castings used in the construction of locomotives and passenger cars. The repairs to cast steel parts has been found to be lower than for cast Fe parts. Ha (9)

Aluminum Casting Alloys in the Construction of Aircraft Engines. (Le leghe di alluminio da fonderia nella costruzione dei motori per aeronautica). C. Panseri. *Alluminio,* Vol. 1, Jan.-Feb. 1932, pages 15-35.

Lists the usual light casting alloys, also Al bronzes and their tensile properties. Includes 38 figures, chiefly photographs of engines and engine parts. The tensile strengths of the different alloys at elevated temperatures are plotted up to 350° C. A diagram shows how shrinkage flaws at a change of section may be eliminated either by chills or by feeding. A hollow airplane propeller, of the Haw type, made in Berlin, in which the stress is supposed to be carried chiefly by alloy steel members inside the propeller, and which uses an Al alloy casting for the shell is illustrated, but Panseri does not think a cast alloy is suitable for such service. See also *Metals & Alloys,* Vol. 3, July 1932, page MA212. HWG (9)

Expanded Metal Sheets Find New Use in Stockroom Partitions. *Steel,* Vol. 90, Feb. 15, 1932, page 27.

Discusses the uses and advantages of expanded metal sheets for the construction of stockroom partitions. JN (9)

Material and Construction Problems of Fittings in Modern Steam Technique. (Material- und Konstruktionsfragen bei Amaturen in der neueren Dampftechnik.) F. A. M. Wüllinghoff. *Die Röhrenindustrie,* Vol. 21, Jan. 15, 1931, pages 13-15, Jan. 29, 1931, pages 26-29; Feb. 12, 1931, pages 38-40.

Cast iron, bronze (86 Cu, 10 Sn, 4 Zn), Monel metal, alloy steel as well as the different metallic and non-metallic gaskets for valves are considered. At high temperatures (500° C.), special bronzes with additions of Al, Sb, Fe, Mn, Ni, Si are developed. The use of Mo-bearing cast steel or of nitrided fittings is recommended. Then the material for gaskets, flange screws, fittings in touch with fuel or lubrication oil, compressed air, blast furnace or city gas, ammonia, chemical reagents are discussed. The balance of the paper pertains to the design of fittings, their manufacture and mounting. EF (9)

Light Metal Carriages. (Leichtmetall - Stadtbahnwagen.) C. Wagner. *Glasers Annalen,* Vol. 55, Dec. 1, 1931, pages 100-109.

German State Railways ordered 2 trains of cars of light metals. The 2 different designs of the Linke-Hoffmann-Busch Works, Bautzen, and of the Wegmann Co., Kassel, are described in detail. In spite of the fact that a comparison is made with interborough express train cars of steel which are appreciably lighter than ordinary railway cars, the weight of the former cars is reduced by 8.5% and 11.5% respectively due to the utilization of light metal alloys. EF (9)

Jigs and Fixtures Made of Welded Steel. J. R. Weaver. *Metal Progress,* Vol. 21, Mar. 1932, pages 32-36.

The production of jigs and fixtures is speeded up and cost reduced by substituting welded plates and base for cast iron. Standard hot rolled steel plate and bars may be carried in stock and modified by oxyacetylene cutting. Maintenance cost of steel fixtures is only 15% of that for cast iron tools. Welded jigs require normalizing to a temperature of 1000°F. WLC (9)

A Large Span All-Welded Building. Hope A. McCreadie. *Welder,* Vol. 3, May 1932, pages 3-7.

Construction details of stanchions, N-type roof girders, roof trusses, purlins, bracings, gutters and their supports for a building of 160 feet, span are described. Ha (9)

Welded Highway Bridge in New Zealand. P. B. MacDowell. *Welder,* Vol. 3, May 1932, pages 37-40.

A bridge comprising 6 spans of 80 ft. each was strengthened by arc welding stiffeners to it. Construction details and the methods of procedure are described. Ha (9)

Wrought Iron Disappearing from Europe. Correspondence from F. G. Martin. *Metal Progress,* Vol. 21, Apr. 1932, pages 68-69.

Writer comments on the decreased production of wrought Fe in the British Isles. The present inactivity in the shipbuilding industry is largely responsible for the slump. WLC (9)

The Suitability of Widia Cutting Edges for Drilling in Solid Rock. (Ueber die Eignung von Widia-Schneiden beim Bohren im festen Gestein.) O. Mueller & H. Woehlbier. *Krupp'sche Monatshefte,* Vol. 13, Mar. 1932, pages 89-98.

Drilling tests were made with different types of cutting edges of Widia metal (tungsten carbide) in rock salt, slate and sandstone and the energy consumption determined. The practical problem can be considered as solved but the economical advantage can be determined only by practical test in the individual case. The apparatus, shape of tools and test methods are described and the results tabulated showing energy consumption in the different cases. Ha (9)

Fine Finish on Metal Furniture. W. V. Morrow. *Metal Progress,* Vol. 21, Apr. 1932, pages 27-32.

The steel finding widest application in the furniture industry is a high grade, open-hearth sheet (C 0.05-0.10%) which is reannealed, full pickled, cold rolled, stretcher leveled, resquared, and oiled to prevent corrosion as a preliminary to the manufacturing operations. The actual finishing frequently includes 2 cleaning operations, 3 sandings, 5 bakings, one graining, and one rubbing in addition to the application of several coats of varnish. Finishing treatments are rigidly controlled by examination of test specimens. WLC (9)

Pistons of Aluminum Alloy for Diesel Motors. (Pistons en Alliage d'Aluminium pour Moteurs Diesel.) G. Mortimer & J. F. Paige. *Revue de l'Aluminium,* Vol. 9, Jan.-Feb. 1932, pages 1621-1637; *Alluminio,* Vol. 1, May-June 1932, pages 145-159.

The process of making cast pistons of Al alloy is described very fully, the advantages due to greater lightness and elimination of seizing often happening with cast steel or cast iron pistons are pointed out. The design is described in detail; the alloy employed has an expansion coefficient of only 0.0000119. The heat treatment consists in heating at first rapidly to 530° C. and quenching in water; then heating normally to 530° C. and quenching again; the third time it is heated to 530° C. but left to cool in air; after this it is heated a fourth time to the same temperature very rapidly and cooled slowly in air. The material now has a breaking strength of 12 tons/in.^{2}, elongation none, Brinell hardness of 70 to 80. The manufacturing process is illustrated. AWC+AH+Ha (9)

HEAT TREATMENT (10)

Methods of Heating and Cooling Wire. J. A. Doyle. *Wire & Wire Products,* Vol. 7, May 1932, pages 141-144, 169; June 1932, pages 190-195, 206.

The uniformity of wire products depends greatly on the heat treatment; the points to be taken care of in temperature control, uniform exposure to heat and manner of cooling are discussed and their relation to quality and cost considered. Part II. Deals particularly with the proper care during heating and cooling and gives diagrammatic sketches of various furnaces with built-on cooling or quenching arrangements. The fuel question in connection with bright annealing and clean annealing, and the use of electric or fuel heating is discussed at length. Ha (10)

High Speed Steel. O. W. Ellis. *Canadian Chemistry & Metallurgy,* Vol. 16, June 1932, pages 173-176, 178; July 1932, pages 204-205.

A discussion of certain characteristics of 18-4-1 steel in the solid state and of results of experiments conducted by the Ontario Research Foundation in conjunction with some Ontario members of the A. S. S. T. Several photomicrographs are shown which permit judgment as to the treatments accorded the specimens examined. The most important point brought out by the joint tests is that, despite differences in the type of equipment and of technique, very uniform results can be obtained in the heat treatment of high speed steel by workers following the specified procedure. Drawing at 1000°F. results in a great uniformity of hardness. It may be due to almost complete precipitation of such carbides as have been held in solution by the steel as a result of quenching. WHB (10)

Can Cracking Be Eliminated? (Peut-on éviter les tapures). Jean Chanzy. *Revue de Métallurgie,* Vol. 29, June 1932, pages 281-300.

No cracking on heating or cooling will occur in a metal when the dilatation of it in a given interval is less than the elongation of the metal at the same temperature. Only the surface layer of the metal should be considered in studying the temperature effects. The coefficient of dilatation is fairly well known from dilatometric curves. The elongation at elevated temperatures can be determined by actual experiments, though an assumption must be made that the elongation along all 3 axes of coordinates is the same which is not the case. Cracking limits for given temperatures are expressed by a curve which is a function of elongation-dilatation ratio. With this curve it is possible to derive by a simple graphic method the limits of the temperature gradients both in heating and cooling which would not produce cracking when applied to the given metal. For practical purposes these steps are around 500°C. The curve of cracking usually shows a maximum at about 200°C. and a minimum at about 500°. In such a case the following steps can be used for heating: 120°, 500°, 950°, 1450° and for cooling: 1450°, 610°, 330°, 0°. When sharp maxima and minima are lacking a division of the temperature into uniform steps of 450°-500° would produce satisfactory results. This division of the heating range is particularly important because most of the common defects in steel are caused not by an absolute temperature but by the large temperature differences. Application of this principle to heat treating of high speed steel (0.7 C, 18 W, 4.5 Cr, 0.8 Mo, 0.8 V) showed that for 13 mm. squares the substitution of the usual recommended treatment (10 min. at 150°, 28 min. at 900°, 3 min. at 1325°C.) with subdivided heating (3 min. at 450°, 3 min. at 900°, 3 min. at 1325°C.) in both cases followed by an identical quenching in oil has given a better hardness for the short time treatment. The latter treatment followed by divided quenching using furnaces heated to 860°C., to 450°C. and the final air cooling produced a better hardness than the usual heating cycle and the oil quench. 3 minute intervals were allowed for each furnace. No drawing was used, but the results obtained were only a little lower than those obtainable with the same heating method and the optimum drawing treatment and were somewhat higher than the figures produced by the usual quenching practice and the best known drawing. As long as quenching can be considered as a means for prevention of certain reactions taking place in steel on normal cooling, it can be thought that for a given steel the reactions will depend on temperature and composition alone. Plotting curves not involving time element by using for ordinates the amounts of the transformed matter we shall see that the apparent transformation point is considerably lower than that derived from theoretical considerations. On account of this the transformation point of a steel heated to a higher temperature appears to be lower because for a given temperature the cooling speed is lower the higher is the temperature from which the cooling started. This can be easily checked with a dilatometer. With the repeated short heatings it does not seem to be necessary to increase the quenching temperatures to the usual range in order to produce the same amount of transformation on quenching. The speed of quenching is greatly affected by the dimensions of the article, the composition of steel and the character of quenching media. Comparing the curve representing the reactions in steel which are to be suppressed by quenching with the diagrams showing the speed of cooling obtainable on subdivided quenching we can see whether the intensity of the quenching action in any given period is sufficient, more than sufficient or insufficient to produce the corresponding transformations, as compared with those obtainable with the usual practice. 3 examples of steels are given to illustrate these 3 possibilities. The determination of cooling curves was made by a calorimetric method. A table is given presenting the rates of transformation in steels treated in the usual and the new method covering the whole range. A formula for the determination of the rate of the decomposition is proposed. The paper is illustrated with 33 diagrams and microphotographs. JDG (10)

The Mechanical Surface Treatment in the Manufacture of Automobiles. (Einiges aus der mechanischen Oberflächenbehandlung im Automobilbau.) Guido Prachtl. *Die Werkzeugmaschine,* Vol. 36, June 5, 1932, pages 195-199; June 30, 1932, pages 222-226.

See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 41. GN (10)

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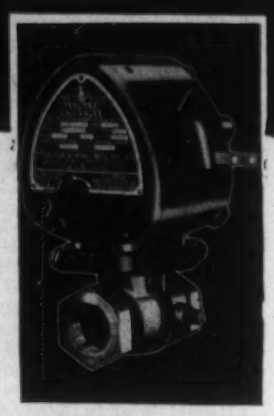

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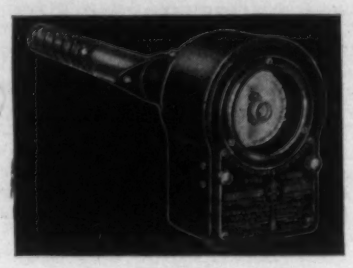

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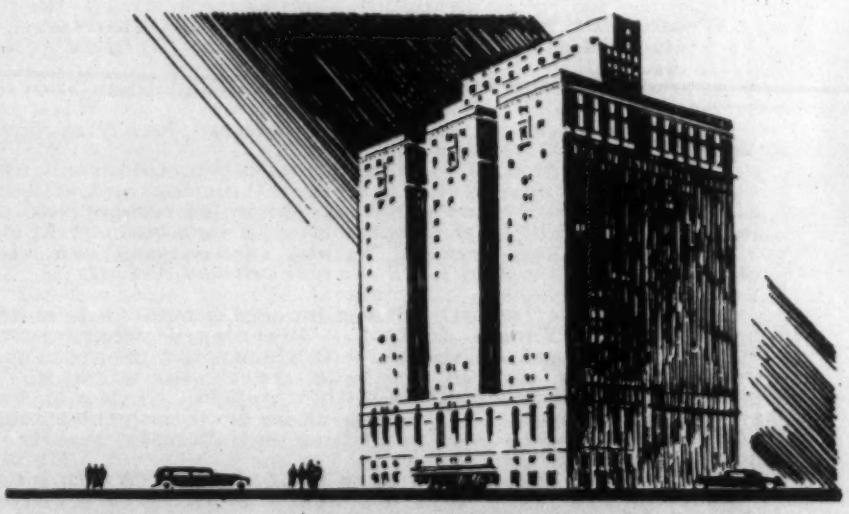

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JOINING OF METALS & ALLOYS (11)
Welding & Cutting (11c)

Resistance Welding of Aluminum. D. I. Bohn. *Industry & Welding,* Vol. 3, Mar. 1932, pages 18-20.

Due to its considerably higher heat and electric conductivity and greater mechanical weakness just below the melting points, automatic resistance welding of Al requires a different setting of the welding outfit from that for steel welding. The conditions for butt welding and the setting of the electrical relays are briefly discussed. Ha (11c)

Gas Welded Steel Structures at the German Building Exhibition, Berlin, 1931. (Autogen geschweisste Stahlbauten auf der deutschen Bauausstellung, Berlin, 1931.) W. Boos. *Zeitschrift für Schweisstechnik,* Vol. 21, Aug. 1931, pages 177-182.

A curious 3-story diving tower 10m. in height assembled by gas-welding is detailed. The accomplishment of the strut connections are stressed showing the remarkable possibilities of this joining method. A gas welded exhibition hall of 90 m. over-all length is regarded as the largest structural frame of its kind in Europe. Gas welded steel radiators are claimed to be superior to cast iron ones. EF (11c)

The Fusion Oxy-Acetylene Welding. (La Soudure Autogène Oxy-Acétylénique.) André Bilard. *Revue Universelle des Mines, Series* 8, Vol. 7, Feb. 15, pages 276-291.

Historical development of the method, apparatus for its application, the manufacture of oxygen and acetylene, best methods for economy and quality for steel as well as for other metals, requirements for the welding rods, testing methods of the welds are treated in detail and a number of illustrations of welded parts and structures are given. The advantages of oxy-acetylene cutting are also discussed. Ha (11c)

Applying Welding in the Piping Industry. H. F. Bartlett. *Welding,* Vol. 3, Apr. 1932, pages 245-248.

Development of pipe fittings for welded installations has contributed largely to the growth of this field. There is a need for the development of design standards which will make full use of the engineering knowledge already available on the entire subject of piping. TEJ (11c)

The Experimental Determination of the Values of Fillet Welds in Tension. Leon C. Bibber. *Journal American Welding Society,* Vol. 11, May 1932, pages 16-19.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The author sets forth his theory for the calculation of stresses in fillet welds under tension and shows by actual weld tests a remarkable agreement between calculated and actual values. TEJ (11c)

Demolition Bombs, the Use of Modern Welding Processes of Manufacture. H. S. Beckman. *Army Ordnance,* Vol. 12, Mar.-Apr. 1932, pages 341-344.

The particular requirements of material and welds for aerial bombs are set forth and the manufacturing processes are described. Only circumferential welds have stood the severe tests of dropping from more than 2000 ft. altitude on hard bodies. The best results were obtained with the atomic hydrogen process of welding in which nose and tail steel forgings were welded circumferentially to a seamless steel tube. Ha (11c)

Welding of Non-Ferrous Castings. (Das Schweissen von Nichteisen Metallgussstücken.) E. Becker. *Das Metall,* Jan. 4, 1931, pages 1-3.

Application of welding to Cu, Al, Ni and their alloys. WHB (11c)

Arc-Welding Sheet Metal. E. P. Bestler. *Sheet Metal Worker,* Vol. 23, Jan. 22, 1932, pages 37-38, 42.

The advantages of fabricating sheet metal products by arc welding over the old system of riveting and soldering are discussed and illustrated by examples. Important savings can be made in raw material and in labor. Ha (11c)

Welding of Non-Ferrous Metals. (Schweissen von Nichteisenmetallen.) Adrian. *Die Schmelzschweissung,* Vol. 11, Apr. 1932, page 69.

This is a brief report of a symposium held in Frankfurt a. M. by the Verein deutscher Ingenieure, where several speakers enlarged on the present status and progress made in the different welding methods. Particular emphasis was laid on the Arcogen method with which Cu, Ni, Monel, brass and Al can be welded. Other speakers dealt with the strength of welds of duralumin for which satisfactory results are now obtained. Ha (11c)

Remarks on Paragraphs 10 to 12 of the New Welding Code. (Bemerkungen zu § 10/2 der neuen Schweissvorschriften.) Hans Schmuckler. *Die Bautechnik,* Vol. 10, *Der Stahlbau,* Jan. 22, 1932, pages 15-16.

Discusses the methods used and recommended in testing welds: X-ray, stethoscope, sampling, chipping, grinding the weld to the core and etching with cuprous ammonium chloride (Schmuckler's process). MAB (11c)

A Further Practical Suggestion: Sheet Metal Electric Signs. *Sheet Metal Worker,* Vol. 23, Feb. 5, 1932, page 57.

Fabrication by welding of large signs eliminated trouble of creeping joints. Ha (11c)

The Welding of Wrought Iron. James Aston. *Journal American Welding Society,* Vol. 11, May 1932, pages 19-24.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The author gives a historical outline of the manufacture and uses of wrought iron and discusses its chemical and physical properties. The fusion welding characteristics of wrought iron are given, both plastic and fusion welding being considered. Wrought iron possesses in the highest degree the composition and characteristics which are fundamental to good welding. TEJ (11c)

The Progress of Metallic Arc-Welding in the Electrical Engineering Industry. *The Welder,* Vol. 3, Feb. 1932, pages 21-26.

The paper illustrates the utility and economic advantages of welding in the manufacture of machinery for the electrical industry by many examples of welded structures over castings and shows in a table the comparative weights and cost per pound and the saving in cost for structures varying from 140 to 21,300 lbs. welded weight; the savings in weight range from 20 to 66%. Semi-automatic welding, especially where large quantities of metal have to be deposited is recommended. Ha (11c)

Hard Surfacing High Carbon Steel. W. A. Wissler. *Industry & Welding,* Vol. 3, Apr. 1932, page 23.

Stellite is applied on the thoroughly cleaned steel surface by a carburizing flame; it flows in much the same way as solder and wets the surface of the steel. Ha (11c)

Welded Masts of Steel Tubing. (Geschweisste Stahlrohrmaste.) J. Wanke. *Die Bautechnik,* Vol. 10, *Der Stahlbau,* Jan. 8, 1932, pages 6-8.

Investigations included tests on stresses applied to joints, on bending strength of welds, on elasticity, and on torsion strength of joints. MAB (11c)

Engineering and Economic Study of Electric Arc Welding. C. L. Waddell. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 52-54.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. Essentials of good welding design are: (1) complete knowledge of the conditions of service, (2) an accurate analysis of the stresses, (3) proper selection of materials, (4) consideration of economy in fabrication. Essentials of good weld fabrication are: (1) good materials of known chemical composition and physical characteristics, (2) adherence to a definite proved weld procedure, (3) skilled workmanship, (4) competent supervision and inspection. The author describes tensile, bend and nick-break tests made to determine physical properties, particularly ductility, of welds made with various electrodes, both bare and covered. Various factors affecting ductility of welds are listed. TEJ (11c)

Laboratory for Welding Studies. J. R. Townsend. *Bell Laboratories Record,* Vol. 10, May 1932, pages 306-310.

A brief enumeration of the uses of welding with special reference to small work used in telephone apparatus, the methods applied and description of X-ray testing equipment. The new laboratory to study welding processes for the different purposes contains automatic, semi-automatic and hand arc welding, oxy-acetylene gas welding and atomic hydrogen welding equipment. Ha (11c)

Problems Encountered in Flash Welding. E. R. Torgler. *Welding News,* Vol. 3, Jan.-Mar. 1932, pages 2-6.

Four problems in the manufacturing process of Dresser flexible pipe couplings of mild steel were met by welding. The whole procedure is described in detail. Ha (11c)

Electric Welding in South America. J. Thomas. *Welder,* Vol. 3, Apr. 1932, pages 21-24.

Notes on the present status of welding in Brazil, Argentine and Chile. Some examples are illustrated. Ha (11c)

Recent Developments for Welding Pipe. Herbert P. Smith. *Welding,* Vol. 3, June 1932, pages 381-384.

Some suggestions, shortcuts and costs for the installation of various piping jobs. TEJ (11c)

The Welding Designer. (Der Schweisskonstrukteur.) A. Volke. *Die Schmelzschweissung,* Vol. 11, May 1932, pages 89-92.

Attention is again called emphatically to the necessity for the designers in all branches of engineering who employ fusion welding processes abandoning the traditional methods and designing principles used in riveted construction and taking in account the particular character of a weld. The designer must be familiar with the metallurgical and physical properties of the weld and the influence of heat, welding rod, gases, machines, torch and, most important of all, the welder himself. Some typical designs for welded constructions are described. Ha (11c)

Welding Wires for the Acetylene-Welding of Steel. (Ueber Schweissdrähte für die Azetylenschweissung von Stahl.) E. Stree. *Autogene Metallbearbeitung,* Vol. 25, Feb. 15, 1932, pages 52-61.

From a survey of the materials used as welding rods for steel and of the results obtained the following requirements are stated: 100% tensile strength with high elastic limit especially for dynamically stressed structures; a certain content of Mn, Ni, Cr and Mo is advocated; the wire should have 100% strength and flow easily, must not spatter and not form pores. A number of diagrams show the relation of quality of seam to the content of P and Mn, the influence of C, and a few micrographs illustrate the structure of good welds. Ha (11c)

A New Portable High-capacity Torch. (Ein neues transportables Hochleistungsgebläse.) O. P. van Steewen. *Die Schmelzschweissung,* Vol. 11, Apr. 1932, page 77.

A handy, compact blower built into the airchamber gives pressures of 300 to 2000 mm. Hg and can feed 4 to 6 torches for gas, acetylene, etc., or can be combined with a gas line torch. Ha (11c)

Gas Protection During Gas Welding and Cutting. (Gasschutz beim autogenen Schweissen und Schneiden.) G. Stampe. *Dräger Hefte,* No. 158, Nov./Dec. 1931, page 2060.

The special cases of welding and cutting which make the utilization of gas masks indispensable are considered: works accomplished in closed containers, evaporation of metals included in the welding material or coating, generation of poisonous metallic vapor. EF (11c)

Electric Arc and Resistance Welding and Their Applications in Industry. (Les Soudures Electriques a l'Arc et par Resistance et leurs Applications dans l'Industrie.) Theo. Sunnen. *Revue Technique Luxembourgeoise,* Vol. 23, Nov.-Dec. 1931, pages 250-258.

The great advantages of electric welding, both by arc and by resistance, in manufacturing processes, maintenance, repairs, etc., are pointed out and the electrical equipment is described. Ha (11c)

Determination of the Capacity of a Blow-Pipe. (Determination de la Puissance d'un Chalumeau.) Seferian. *L'Usine,* Vol. 41, Mar. 11, 1932, pages 31-33.

A diagram is developed which gives the capacity of a torch in liters of acetylene as a function of the thickness of steel. Al, Cu and Pb to be welded or soldered. Ha (11c)

Welding Extensively Employed in Steel House. Henry Dubin. *Welding,* Vol. 3, Jan. 1932, pages 15-19, 27.

Complete description of welded steel house designed by and built for the author. Masonry walls and battledeck floor construction was used. Sections were fabricated in the shop by use of arc welding, delivered in trucks and field welded into place. About ¼ of the total welding was done in the field. Advantages of this construction are given. Illustrations included. TEJ (11c)

The Welding of Girder Structures. (Schweissen von Fachwerken.) H. Schulz. *Die Schmelzschweissung,* Vol. 11, May 1932, pages 93-97.

The procedure for the welding of a bridge must be entirely different from that of riveting the same structure. The example of a bridge is given of a total length of 83.15 m. with 5 spans of 18, 17.5 and 11.65 m. and built up of tubes. The calculation is given in detail. The process as described is such that no internal stresses will occur in the welded structure which might lead to deformations later on. The saving obtained by acetylene welding of this structure over riveting amounted to 13%. Ha (11c)

Assuming Responsibility for Structural Welding. E. E. Seelye. *Engineering News-Record,* Vol. 108, May 26, 1932, pages 769-771.

Engineer handling his first welded building, Yale University dormitory quadrangle, outlines precautions and procedure that he found useful and efficient. CBJ (11c)

The Safety of Boiler Welding Seams with Special Consideration of Internal Stresses. (Die Sicherheit von Kesselschweissnähten unter besonderer Berücksichtigung von Eigenspannungen.) S. Sandelowsky. *Elektroschweissung,* Vol. 3, Apr. 1932, pages 61-64.

It is shown that regardless of the internal stresses set up but under due consideration of all the other factors electrically welded seams in boilers guarantee the same degree of safety as water gas welded seams. Whereas the load permitted for water gas welded seams in Germany amounts to 10,800 lbs./in.^{2} that for electrically welded seams is but 6100 lbs./in.^{2} Due to the favorable results with the electrically welded seams the author wants a revision of the German standards for electrically welded seams. 6 references. GN (11c)

Progress Made in Construction of Pressure Vessels. G. Raymond. *Welding,* Vol. 3, Apr. 1932, pages 226-230, 257.

Abstract of paper presented before the Tulsa Section of the A.S.M.E. The general acceptance by the petroleum industry, largely in the past 2 years, of fusion-welded pressure vessels for a wide and increasing variety of purposes, is indicative of the progress made in pressure vessel construction. Causes which have contributed to acceptance of welded pressure vessels are: (1) General improvement in quality of all welds, (2) The entire leak-tightness of welded vessels, (3) Economy, (4) Corrosion resistance of quality welds, (5) Ability to construct vessels of great wall thickness. The author reviews early methods of fabricating pressure vessels and then describes the modern shielded arc principle of welding. The A.S.M.E. boiler code and its relation to oil industry uses are discussed. The author points out the importance of having good base metal and illustrates some problems in design of pressure vessels. TEJ (11c)

Gas Cutting. (Das Autogen-Schneiden im Vorrichtungs- und Werkzeugbau.) K. Schmelzer. *Zeitschrift für wirtschaftliche Fertigung,* Mar. 1932, pages 32-34.

A simple gas cutting machine is described which is distinguished from former constructions by its light weight. The new machine is most adaptable to cutting pieces of mass production. The paper concludes with a review of the composition of high alloy steels which can be cut with a cutting torch. GN (11c)

Increase of the Resistance to Repeated Impacts of Welded Pieces. (Augmentation de la Resistance aux Chocs Repetes des Pieces assemblees par Soudure.) D. Rosenthal. *L'Usine,* Vol. 41, Feb. 5, 1932, page 31.

The endurance resistance of welded pieces is usually diminished in the zone between the base of the parent metal and the deposited metal. This condition can, however, be improved by first caulking the zone of the junction. This results in a lengthening of the material in the direction of the axis of junction and in an upsetting effect in the direction across. It is explained that the inner stresses set up by this treatment are the cause of the improvement. The successful treatment, however, requires that the material possess a good ductility. Ha (11c)

American Regulations for Fusion Welding of Steam Boilers and Pressure Vessels. (Amerikanische Vorschriften für Schmelzschweissung an Dampfkesseln und Druckgefässen.) F. W. Rudel. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Apr. 1932, pages 99-103.

The article includes American practice with regard to requirements for welding, the evaluation of welds according to the purposes for which the vessels are used, X-ray testing and other means for testing of welds, hydrostatic tests, and the requirements for annealing welded parts. MAB (11c)

The Development of the Automatic Resistance Fusion Welding. (Die Entwicklung der selbsttätigen Widerstands-Abschmelzschweissung.) E. Rietsch & S. Sandelowsky. *Elektrotechnische Zeitschrift,* Vol. 53, Mar. 3, 1932, pages 197-199; *A. E. G. Mitteilungen,* Mar. 1932, pages 111-112.

The conditions for a good welding joint are: 1. the preheating (if necessary) must take place very rapidly and the heated zone must be small; 2. the time of fusion must be correctly chosen under proper secondary voltage; 3. upsetting (pressing together) must take place like an impact whereby the upsetting pressure must have a definite value depending on the section. Several automatic resistance welding machines are discussed with regard to fulfillment of these requirements. The best machines are controlled by a cam which regulates the 3 conditions according to the sections to be welded. Ha (11c)

Strength and Calculation of Welded Joints in Structures Subject to Bending. (La Résistance et le Calcul des Joints Soudès dans les Pièces Fléchies.) D. Rosenthal. *Génie Civil,* Vol. 69, Oct. 3, 1931, pages 365-367.

The stresses to which welded girders of composite sections are subjected when bending moments occur besides tensile or compression stresses are treated analytically and tested on samples. The test results show that the actual strength is greater than the calculated strength. This is attributed to a gradual equalization of the tensions from the exterior fibers of the structure to the fibers near the neutral axis. Diagrams illustrate the distribution of stresses. Ha (11c)

Coated Electrodes. (Ein Beitrag zur Beurteilung ummantelter Elektroden.) J. Petry. *Elektroschweissung,* Vol. 3, Feb. 1932, pages 25-27.

The author studied the effect on the weldability of various coated electrodes with special reference to the formation of slags and holes. Some practical hints are given as to how coated electrodes are to be used to avoid the disadvantageous effects of the slags formed. GN (11c)

The Prevention of Fractures of Circular Seams. (Ueber die Verhütung von Rundnahtbrüchen.) H. W. Nies. *Die Schmelzschweissung,* Vol. 11, Mar. 1932, page 47.

The author points to the often observed danger in circular welds of containers leading to fractures on account of shrinking stresses set up by the welding process and not removed afterwards by proper treatment. The best means for the prevention of these stresses is adequate shaping of grooves, etc. close to the weld which absorb the stresses. Ha (11c)

Defective Designs of Acetylene Apparatus. (Fehlerhafte Konstruktionen von Azetylenapparaten.) Emil Menz. *Autogene Metallbearbeitung,* Vol. 25, May 15, 1932, pages 147-152.

The design of an acetylene gas producer must take into account as one of the most important requirements that the gas generation does not become too strong especially after temporary overloads; the water access and removal must therefore be arranged so that it quickly responds to the demand for gas. Existing constructions are examined in this respect and the reasons for failures analytically determined. Proper attention should be paid to the cooling of the apparatus and the gas, and the depth to which the carbide can be immersed must not be allowed to produce more gas than the apparatus is rated to give. Cooling of the gas tends also to reduce the cost of welding as the acetylene does not contain so much water vapor. These points are more important if there are several welding places fed from the same acetylene apparatus. Ha (11c)

The Practical Application of the Arcogen Welding Method with particular Consideration of Its Suitability for Welding of the Technically Important Materials. (Die praktische Anwendung des Arcogen-Schweissverfahrens unter besonderer Berücksichtigung seiner Geeignetheit für das Schweissen der technisch Wichtigen Werkstoffe.) H. Muenter. *Schmelzschweissung,* Vol. 11, Feb. 1932, pages 33-35; Mar. 1932, pages 54-59.

Extensive tests with ferrous and non-ferrous metals permit the conclusion that the arcogen welding method is quite suitable for high-C and alloyed steels and that even higher welding velocities can be applied; especially for Cu and Al and their alloys do high welding velocities offer economical advantages. This is not true of Cu alloys with high Zn contents. Numerous micrographs demonstrate the quality of the weld. Ha (11c)

"Premag" Welding of Copper in Australia. J. D. Millar. *Industrial Gases,* Vol. 13, Mar. 1932, pages 28-30.

"Premag" consists of a base-metal filler-rod and cleaning flux and its use for oxy-acetylene welding of non-arsenious Cu is discussed. Typical test figures for welds are: Maximum stress is 13.5 tons/in.^{2} and elongation 32.5% in 4". As to the corrosive resistance of the weld, only a small amount of Cu_2O should be retained. Suitable for work on larger Cu tubing up to 8" in diam., reclamation of Stearine tubes, chlorinator lining, acid vats, and washers, ice-cube boxes. As and high O in the Cu are both fatal to the weld. DTR (11c)

Welding of Monel Metal (Das autogene Schweissen von Monel-Metal im chemischen Apparatebau). R. Müller. *Der Apparatebau,* Vol. 44, Feb. 19, 1932, pages 29-32.

The paper briefly outlines the methods and fluxes to be used in welding Monel metal. Examples of the practical application of welded Monel metal parts are given. GN (11c)

The Present State of Electric Arc Welding. (État Actuel de la Soudure par l'Arc Électrique.) H. Michel. *Revue Universelle des Mines,* Series 8, Vol. 7, Feb. 15, 1932, pages 261-269.

A review and description of the methods now in use for joining metals by the electric arc, with micrographs of welds and illustrations of machinery and structure built up by welding. Ha (11c)

Estimating Welding in Multi-Story Buildings. Frank P. McKibben. *Welding,* Vol. 3, June 1932, pages 364-366.

The author presents a table of data for welding steel building frames which gives important information concerning 6 large welded structural steel projects. The table is intended for use as an aid in estimating welding on structures similar to the ones listed. TEJ (11c)

Altering Wrought Iron and Steel Bridges by Welding. Frank P. McKibben. *Journal American Welding Society,* Vol. 11, Mar. 1932, pages 21-25; *Canadian Engineer,* Vol. 62, Apr. 26, 1932, pages 17-18.

Paper presented at the annual convention of the American Road Builders Association by the author, as a representative of the American Welding Society. Causes which necessitate bridge alterations are: (1) Corrosion, (2) Cracks due to overloading or to defective metal, (3) Excessive stresses, (4) Readjustment of existing members. The article is well illustrated with sketches. VVK+TEJ (11c)

Welded Steel Structures. Hope A. McCreadie. *The Welder,* Vol. 3, Feb. 1932, pages 10-13.

The author points to the still greatly varying working stresses in bridges or large girders of different designs and emphasizes the necessity of accurate formulas being developed for the careful design of practical welded structures; the experience of all countries should be taken into consideration in fixing standards. Ha (11c)

Cause and Cure of Intergranular Corrosion in Austenitic Steels. John A. Mathews. *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 23-27.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The wider use of austenitic steels has been retarded due to fear of failure from intergranular corrosion. The author describes 3 methods of preventing intergranular corrosion, (1) use of low C austenitic steels (.07 max.), (2) heat treatment of welded parts to redissolve the precipitated carbides, (3) the addition of inhibitors such as Ti, Si, Va, Mo, and W to the austenitic Cr-Ni steels to prevent or greatly retard intergranular susceptibility. TEJ (11c)

Welded Building Construction as now Practiced. GILBERT D. FISH. *Welding*, Vol. 3, May 1932, pages 301, 323-324.

In order to become well informed on this subject, an engineer should learn the requirements of safe design, the elements of economy and the methods used to insure proper workmanship. TEJ (11c)

Welding Heavy Castings in an Engine Shop. W. M. ELLIOTT. *Industry & Welding*, Vol. 3, Apr. 1932, pages 8-10, 31.

Methods for welding heavy castings are described, particularly the prevention of the heat flowing away too quickly and the preparation of the parts to be welded together; the convenience for the welder is also considered. Slow preheating to about 1200° F. is recommended. Ha (11c)

Advantage for Insulating Technique in the Use of Welding in Building of Pipe Lines. (Vorteile für die Isoliertechnik bei Anwendung der Schweisstechnik im Rohrleitungsbau.) PAUL EISING. *Die Schmelzschweissung*, Vol. 11, Apr. 1932, pages 66-69.

The employment of welding processes in installing pipe lines has led to considerable economies particularly if the lines have to be insulated for heat or cold, on account of the lack of flanges which greatly simplifies the labor and material for insulating. An example of a 100 m. long steam line shows the differences in heat loss for different conditions and with and without flanges. Another advantage is obtained for vertically running lines as the weight is less and the supports can be lighter and also welded on. Ha (11c)

Discussion of the Symposium on Ductility of Weld Metal. G. DOAN. *Journal American Welding Society*, Vol. 11, May 1932, pages 26-28.

The author discusses ductility of welds, referring to various opinions presented at the Symposium on Ductility of Weld Metal at the Annual Meeting of the American Welding Society in New York, Apr. 1932. It is the author's opinion that high ductility of weld metal is desirable since the danger of cracking during cooling will be greater in the weld than in the joined parts due to (1) greater local shrinkage in volume; (2) greater concentration of stresses by flaws in the weld; (3) weaker condition of the hotter metal. TEJ (11c)

Some Methods and Effects of Machine Gas Cutting. L. M. CURTISS. *Paper* read before the 32nd Annual Convention, *International Acetylene Association*, Nov. 1931, 6 pages; *Journal American Welding Society*, Vol. 11, Jan. 1932, pages 19-22; *Blast Furnace & Steel Plant*, Vol. 20, Mar. 1932, pages 270-271; *Metallurgist*, Feb. 1932, pages 29-30. See *Metals & Alloys*, Vol. 3, July 1932, page MA 216. VVK+MS+Ha+TEJ (11c)

Welded Steel and Galvanized Tanks. JOSEPH C. COYLE. *Welding*, Vol. 3, May 1932, pages 303-304.

Description of several practical "shop-kinks" which have been devised in tank shop to expedite production. TEJ (11c)

General Discussion on Ductility. J. H. CRITCHETT. *Journal American Welding Society*, Vol. 11, May 1932, pages 28-29.

A general discussion of the papers presented at the Symposium on Ductility held at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The author concludes that while ductility in weld metal is an important element, extreme ductility is not necessary and is a minor element as compared with sound design, choice of high grade materials, careful attention to fabrication and thorough proof testing before use. TEJ (11c)

New Aspect in Pipe Welding. WILLARD P. CURLEY. *Journal American Welding Society*, Vol. 11, Apr. 1932, pages 33-35.

Paper presented at the Annual Meeting of the American Welding Society in New York, Apr. 1932. The author briefly traces the various cycles through which the application of welding pipe has passed and discusses recent progress in this field. TEJ (11c)

Special Shielded Arc Technique Used in Welding Sheet Metal Hoppers for Coal Stokers. A. F. DAVIS. *Sheet Metal Worker*, Vol. 23, Mar. 4, 1932, page 109.

A magnetic field is used which controls and focuses the carbon arc of a small diameter carbon along the line of fusion. No welding wire is used, a flux is painted on the edges to be welded which gives off a gas, shielding the metal while molten; a weld of good tensile strength and extreme ductility is obtained in this manner. The method is used in mass production. Ha (11c)

What Does It Cost to Weld Pipe and Fittings? ARTHUR E. CHRISTEN. *Welding*, Vol. 3, June 1932, pages 385-388.

The author offers a standard method of calculating welding costs. TEJ (11c)

The Effect of Flame Cutting on the Properties of Steel. (L'Effet du Découpage au Chalumeau sur les Propriètès de l'Acier.) CHARLES CEHASSE. *Revue Universelle des Mines*, Series 8, Vol. 7, Feb. 15, 1932, pages 292-302.

The results of metallurgical and micrographic tests on the influence of the flame in cutting steel is summed up as follows: The change of the steel in the neighborhood of the cut is in most cases very small, and often is even beneficial to its mechanical qualities. No special precautions need be taken for cutting ordinary steels with 40 to 60 kg./mm.^{2} and no further machining or other treatment is required if the cut by flame can be neatly made. Besides, if the flame-cut pieces are later to be joined by welding this process provides a sufficient heat treatment to eliminate any ill effect of the previous cutting. Ha (11c)

Recent Structures Wholly of Welded Steel. (Neuere vollständig geschweisste Stahlkonstruktionen.) F. FALTUS. *Die Bautechnik*, Vol. 10, *Der Stahlbau*, Feb. 5, 1932, pages 23-24.

Discusses the advantages of welding structures. Tests were made on welded parts for resistance to wind pressure. The various methods of construction are enumerated. MAB (11c)

Comments on Automatic Arc Welding. A. F. DAVIS. *Metals & Alloys*, Vol. 3, Feb. 1932, pages 46-48.

The writer discusses the article by Candy in Nov. 1931, *Metals & Alloys*, on this subject and presents data on tensile tests of shielded arc welds. For abstract of paper see *Metals & Alloys*, Vol. 3, April 1932, page MA 100. WLC (11c)

WORKING OF METALS & ALLOYS (12)

Melting & Refining (12a)

Desulphurization of Thomas Pig Iron. (Ueber die Entschwefelung des Thomasroheisens.) EDGAR SPETZLER & HELMUT SPITZER. *Stahl und Eisen*, Vol. 52, Mar. 10, 1932, pages 233-235.

Report 223 of Steel Mill Committee Verein deutscher Eisenhüttenleute. Includes discussion. Series of extensive practical tests with high-S Thomas pig iron, desulphurizing between blast-furnace and converter. Short supplemental tests consisted of adding calcined lime in pig iron ladle during casting, temporary shutting off mixer firing, and addition of "Walter" briquettes to converter ladle. (1.) Desulphurization on way from blast furnace to mixer. Calcined lime, 1 to 5 mm. pieces, was added to ladle runner in amounts from 1.5 to 2.0 kg./ton pig iron over 4-day period.

Table 1.

	% Sulphur Blast Furnace	% Sulphur Mixer	Sulphur Decrease Actual	Sulphur Decrease %
Pig iron—not treated	0.0777	0.0688	0.0089	11.5
(No. tests)	(143)	(143)		
Pig iron—treated	0.0830	0.0678	0.0152	18.3
(No. tests)	(149)	(149)		

(2.) Desulphurization in mixer. (a.) Calcined lime, 1.25 kg./ton, was added to mixer by shovelfuls.

Table 2-a

	Entering mixer	Leaving mixer	Decrease Actual	Decrease %
Mixer-not treated	0.067	0.065	0.002	3.0
(No. tests)	(105)	(72)		
Mixer-treated	0.068	0.059	0.009	13.0
(No. tests)	(105)	(72)		

Computation of mixer slag showed:

	% SiO_2	% CaO	% MnO	% S
Regular mixer slag	40.7	21.2	14.9	0.97
Treated mixer slag	35.7	30.2	12.4	1.27

(b.) During test run firing heat on mixer was shut off.

Table 2-b

	% Sulphur Entering mixer	% Sulphur Leaving mixer	Difference Actual	Difference %
Mixer heated	0.0656	0.0673	+ 0.0017	+ 2.6
(No. tests)	(36)	(55)		
Mixer not heated	0.0656	0.0557	— 0.0099	— 15.1
(No. tests)	(36)	(55)		

During this run, temperature loss without heat on mixer 60° C. and with heat on mixer 32° C. (3.) Desulphurization on way from mixer to converter. "Walter" foundry briquettes were added, 0.22% of pig iron weight, during filling of converter ladle, and after 10 min, reaction, slag was covered with calcined powdered lime. The S was decreased approx. 30% as against 6% without this treatment. Time factor and cost of briquettes, 1.60 R.M./ton, are too high for economy. DTR (12a)

Pitch Coke as a Carbonizing Agent in Steel Mill Operation. (Pechkoks als Kohlungmittel im Stahlwerksbetrieb.) L. HIMPE. *Stahl und Eisen*, Vol. 52, Mar. 24, 1932, pages 295-296.

Pitch coke is found to be highly suitable for carbonizing steel. Has higher C-content and density, and gives less ash than either charcoal or petroleum coke. S in pitch coke is less than in petroleum coke, but higher than in charcoal. However its S gives no harmful effects to steel. Time for adding pitch coke to a charge is much less than for either charcoal or petroleum coke. Solubility is good. Decreased coke charges follow. DTR (12a)

The Production of Remelted and Guaranty Zinc Low in Iron. (Zur Herstellung von eisenarmen Remelted-und Garantiezink.) WILHELM HERMANN. *Chemiker-Zeitung*, Vol. 56, Feb. 17, 1932, pages 133-134.

In remelting Zn from scrap most of the Fe must be removed. The maximum allowed in remelted Zn is 0.25-0.30%. A reverberatory furnace with a deep hearth is preferable to one with a shallow hearth. In this type of furnace there is no contact with Fe and the bottom of the melt where the Pb settles is cooler than the rest of the melt. When melting in indirect fired iron melting pots the bottom of the melt is the hottest. The pots should be cast top up in order to secure a sound bottom and the rough surface should not be removed by machining. The addition of 2% Mn to the Fe is advantageous. A lime or graphite wash in the pot helps to prevent Fe from being absorbed by the Zn. Fe is removed by stirring S into the melt. For the removal of Pb the reverberatory furnace is better. CEM (12a)

Determines Inclusions in Steel by New Method. *Steel*, Vol. 88, Feb. 5, 1931, pages 57-58.

A resume of the research work on the physical chemistry of steel making carried out during the past year by the Pittsburgh Experiment Station, U. S. Bureau of Mines. Based on Bureau of Mines Report No. 3054. See "Fundamental and Applied Research on the Physical Chemistry of Steel Making." *Metals & Alloys*, Vol. 2, Feb. 1931, page 42. JN (12a)

The Behaviour of Manganese in the Acid Open-Hearth Process. E. MAURER & W. BISCHOF. *Iron & Steel Institute, Advance Copy* No. 12, May 1932, 30 pages.

From data obtained from several commercial melts the constant "K" in the following equation is obtained:

$$K = \frac{(Fe)\,Mn}{(Mn)}$$

The quantities (Fe) and (Mn) give the corresponding weight concentrations of the slag, and the quantity Mn the Mn concentration of the metal bath .The dependence of "K" on the slag composition is determined, and the effects of temperature are estimated. Calculations using the values obtained are in good agreement with plant data. 15 references. JLG (12a)

Some Metallurgical Points on Acid Open-Hearth and Electric Steel for Castings. F. A. MELMOTH. *Transactions & Bulletin American Foundrymen's Association*, Vol. 2, Nov. 1931, pages 458-495.

Physical and microscopical comparisons were made of acid open-hearth and electric steels for castings of close chemical composition and given absolutely identical heat-treatment. See *Metals & Alloys*, Vol. 2, July 1931, page 134. CHL (12a)

Casting & Solidification (12b)

The Heterogeneity of a Sand-Cast Steel Ingot. A. Kulz. *Iron & Steel Institute, Advance Copy* No. 10, May 1932, 10 pages.

Steel containing 0.35% C, 2.06% Ni, 0.35% Cr and 0.24% Mo was cast into a preheated sand mold. The greatest diameter of the ingot was 1.4 m., and the ingot proper was 2.2 m. high. The hot top was 1 m. high. The ingot was sectioned longitudinally, and the cavities observed. The pipe extended throughout 60% of the ingot plus hot top. Cavities 0.02 to 0.08 mm. wide were observed on the axial section. The structure was determined by etching and by S prints. The vertical segregations were broader and more pronounced than in chill-cast ingots. Drillings from various sections were analyzed. The highest and lowest values were:

	Ladle %	Lowest %	Highest %
C	0.35	0.27	0.48
Mn	0.59	0.56	0.63
Si	0.27	0.24	0.29
P	0.033	0.018	0.051
S	0.021	0.012	0.034
Ni	2.06	2.03	2.08
Cr	0.35	0.35	0.36
Mo	0.24	0.22	0.30

The sand-cast ingot was compared with chill-cast ingots previously studied. JLG (12b)

Centrifugal Casting of Non-Ferrous Metals. *Metal Industry,* N. Y., Vol. 29, Dec. 1931, page 516.

Taken from "Centrifugal Casting of Metals and Alloys" by J. E. Hurst, *Metals & Alloys,* Vol. 2, Oct. 1931, pages 196-205. For abstract see *Metals & Alloys,* Vol. 3, May 1932, page MA 136. PRK (12b)

The Melting and Casting of Magnesium Alloys. (Das Schmelzen und Giessen von Magnesiumlegierungen.) R. Thews. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 17, 1932, pages 165-167.

A summary. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 252. GN (12b)

Utilize Pressure in Casting Brass. *Foundry.* Vol. 59, Dec. 1, 1931, page 49.

Die casting by the pressure method is being applied to brass die castings. The Titan Metal Mfg. Co., Bellefonte, Pa., has installed 3 brass die casting machines made by Josef Polak, Prague, Czecho-Slovakia. The American Brass Co. has installed 2 pressure brass die casting machines designed by Charles Pack and the Doehler Die Casting Co. is now installing 6 designed by their own engineers. VSP (12b)

Fourth Report of the Heterogeneity of Steel Ingots. A. Joint Committee of the Iron & Steel Institute and the National Federation of Iron & Steel Manufacturers to the Iron & Steel Industrial Research Council. *Iron & Steel Institute, Advance Copy,* May 1932, 204 pages.

Section I describes tests made on 27 ingots, most of which were cast in a standard 36-cwt. mold. Of these, 18 were killed steel and the remainder rimmed steel. The ingots were sectioned and the heterogeneity determined. The results of each test are described in detail and the mechanism of solidification is deduced from these and earlier tests. Section II gives the results of O analyses made by a H-reduction method. Chips were fused with a Sn-Sb alloy. The O given off as CO was determined by catalyzing the reaction to form CH_4 and H_2O and determining H_2O. Section III discusses silicates in steel, and gives results obtained by the Dickenson method. Section IV discusses the principles involved in making rimmed steel. Mechanisms by which rimming may be effected are suggested, but it is concluded that the exact action occurring during rimming is not known. A bibliography of 48 references on rimmed steel is appended. Section V is in reference to pyrometry as applied to liquid steel. From a series of laboratory and shop tests it is concluded that the disappearing filament pyrometer is more practicable than the polarizing pyrometer. The agreement between results obtained by means of the former instrument, however, was not especially good. It is suggested that more care should be exercised in selecting the filters used with optical pyrometers. Attempts to measure temperatures of liquid steel by thermocouples and other means were unsuccessful. Part 1 of Section VI, by J. G. Pearce and E. Morgan, gives the physical properties of some ingot-mold irons. The irons are high in C and contain large graphite flakes. They are pearlitic as cast. The composition changes during use. Part 2, of Section VI, by J. W. Donaldson, reports thermal conductivities of some ingot irons at temperatures up to 425° C. Section VI contains 23 references. Section VII, by N. M. H. Lightfoot gives "Some Further Mathematical Considerations Concerning the Cooling and Freezing of Steel Ingots." Estimations of the effects of a poorly conducting layer between the molten steel and the ingot mold and the effects due to separation of the ingot from the mold are included. Section VIII is a bibliography of 130 references. JLG (12b)

Castability Varied by 23 Foundry Conditions. Correspondence from A. Portevin. *Metal Progress,* Vol. 21, May 1932, pages 68-69.

The writer discusses 5 classes of factors influencing the castability of alloys. A spiral test casting is used to test the property of castability. Castability increases with the superheat and is inversely proportional to difference in temperature between mold and melting point. It varies inversely as the solidification range and depends upon the form of crystals. WLC (12b)

Highly Accurate Parts from Tin-Base Alloys. H. L. Spaunburg. *Product Engineering,* Vol. 3, Apr. 1932, page 160.

For small accurate parts Sn-Sb-Cu alloys are used for die-casting; the tensile strength runs as high as 10,000 lbs./in.^{2} with a Brinell hardness of 30. The best pouring temperature is 800° F. Intricate designs of parts with close tolerances can be produced, and the white non-tarnishing color often eliminates the need of plating. Ha (12b)

Construction and Operation of Casting Pits. (Bauart und Benutzung der Giessgrube.) Fr. Vogelsang. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 137-139.

General discussion of points to be observed in constructing and operating casting pits. GN (12b)

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Comments on Steel Works Metal Molds. (Einiges über Stahlwerkskokillen.) C. V. MESZOELY. *Die Giesserei,* Vol. 19, Feb. 19, 1932, pages 61-66.

Proper construction of a metal (chill) mold is of great importance to its life; the relations of taper for ingot and taper of the walls to the length of the mold and to the thickness of walls and ingot are investigated. A table is given for the best practice of wall thickness as dependent on the weight of the ingot. The best material for these molds is a hematite iron of about 3.8 to 4.2% total C, 0.3 to 0.5% fixed C, graphite 3.2 to 3.9%, Si 2.2 to 2.5%, Mn max. 0.8%, P 0.09%, S 0.03%. The structure should show fine lamellae of pearlite with fairly much free ferrite, and the hardness should not be higher than 120 Brinell. A few other compositions are added which also give good results. New molds should be treated carefully until the inner stresses are eliminated; they should be preheated and, after use, cool slowly. If possible, molds should not be used too often in succession, it is preferable to let them cool between heats to be touched by hand. Also the place of the mold on the car should be changed every time if possible. Ha (12b)

The Castability of Alloys and its Relation to the Solidification Interval (Coulabilite des alliages. Relation avec l'intervalle de solidification). A. PORTEVIN & P. BASTIEN. *Comptes Rendus,* Vol. 194, Mar. 7, 1932, pages 850-853.

In a previous article (*Comptes Rendus,* Vol. 194, Feb. 15, 1932, 599-601) the authors discuss at considerable length an expression for the castability of pure metals. In the present paper they describe the results of experiments in which a metal mold was again employed, but in which attention was directed to the relationship between the castability and the constitution of 2 systems of alloys—namely, Pb-Sb and Sb-Cd. 2 laws have issued as a result of their experiments—(1) the castability varies inversely with the solidification interval and (2) the castability depends upon the mode of solidification and is relatively greater when definite compounds are formed than when solid solutions are produced. The results prove once again, if this is necessary, the difference between fluidity and castability, of which fluidity is only a secondary factor. The 2 laws referred to allow of a correct interpretation of the castability curves of the Mg-Al and Mg-Cu alloys, which are particularly affected by oxidation and by the production of films of magnesia. The authors have studied the effect of remelting on these alloys and have found that the castability increases as a result of changes in chemical composition, then reaches a maximum, and finally diminishes, owing to the thickening of the alloy through the presence of oxides or nitrides. The article is accompanied by 2 diagrams, showing the relationship between the castability and the constitution of the two alloy systems, Pb-Sb and Sb-Cd. OWE (12b)

Steel; the Casting of the Ingot (L'acier; la Coulée de l'Ingot). MARCEL GUÉDRAS. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, Mar. 1932, pages 99-101; Apr. 1932, pages 142-146.

Top and bottom pouring are discussed. The time required to cast a mold by using nozzles of different sizes was determined.

Diameter of nozzle	Speed of pouring in tons/minute
30 mm.	1.1 Tons
35 mm.	1.6 Tons
40 mm.	2.1 Tons
45 mm.	2.6 Tons
50 mm.	3.1 Tons
60 mm.	4.6 Tons

The ingots used for sheets and for forgings require a pouring of 900 kg./min. for C steel and 600 kg./min. for Ni steel. It is suggested that the cooling and the formation of an ingot take place in separate layers starting from outside toward the center. In practice it was found that the casting at high temperature produces a spongy cavity along the axis of the ingot. Schwartz treatment of hot top is also discussed as well as reheating the ingot top by means of electrodes to reduce the formation of pipe. GTM (12b)

Press Casting. CHARLES PACK. *Metals & Alloys,* Vol. 3, Feb. 1932, pages 29-37.

Editorial comment prefacing this paper mentions the wide use of die casting alloys and development work done and being done to brighten the dark side presented by Mr. Pack. 4 references. The history of casting metals is briefly recounted. Casting in metal molds may be divided into permanent mold and die casting methods in present commercial use. The permanent mold process employs a metal mold into which the molten metal is introduced by the pressure of gravity, the mold being separate and somewhat removed from the melting equipment. The product of this practice is somewhat superior in accuracy and properties to the ordinary sand castings. Die casting is conducted in 2 types of machines. One in which the metal runs by gravity into a cylinder from which it is forced by a plunger into the mold or die. The other or goose-neck machine employs air pressure to force the molten metal from a flask-shaped ladle into the die. In both of the above cases the die equipment is very close to the melting pot and consequently subject to temperature gradients which frequently result in misalignment. The goose-neck type of machine is capable of handling the Al base type which cannot be handled in the plunger type machine. The disadvantages of both these methods are the proximity of the die to the melting pot, contamination of the metal by Fe from the pot and in the case of the goose-neck machine the introduction of dross and hard spots into the castings. Both types are incapable of handling alloys of the best properties beside the dross, contamination and internal imperfections introduced by the nature of the process. Press-casting as it is being used in Europe and this country avoids the disadvantages of both die casting and retains the good points of both. The author describes several types of press-casting machines. This process is essentially a permanent mold removed from the melting equipment so that misalignments do not occur by reason of the heat of the molten metal pot and during the casting operation is subjected to pressure from a suitable press. In this type of machine greater pressures are obtainable and it is capable of handling higher melting metals. It is a forging process on molten metal. WLC (12b)

Rolling (12c)

Blooming Mill Rolls. J. H. HITCHCOCK. *Rolling Mill Journal,* Vol. 6, Jan. 1932, pages 27-29.

Formation of fire cracks is due to unequal temperatures of the surface and of the interior of the roll. Water cooling of the surface reduces the difference in temperature, thus limiting the extent of fire cracking. It has been found that the use of 0.85-2.70% Ni in the roll metal reduces the susceptibility to fire cracking. High Ni content is advantageous also in that less wear will occur in a given set of passes than with plain C steel. Chief disadvantage of high Ni content is that it gives the rolls a slippery surface and deprives them of the gripping qualities which are so essential. For these reasons blooming-mill rolls are provided with ragging. It is important that the grooves of all forms of ragging be shallow and well rounded rather than deep or sharp-cornered. Grooves should not be placed where the speeds of the bar and of the rolls are far from equal. Many roll designers prefer to use a double set of helical grooves for ragging, each set being cut at an angle of about 30° from the direction of the roll axis. MS (12c)

Copper-Wire Rolling Mills. (Kupferdraht-strassen.) CH. BERNHOEFT. *Zeitschrift für Metallkunde,* Vol. 24, Apr. 1932, pages 90-93.

An account of the practical details in the design of Cu-wire rolling mills. RFM (12c)

Continuous Rod Mill With Vertically Arranged Motors. (Kontinuierliche Drahtstrasse mit obenliegenden Motoren.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Mar. 20, 1932, page 153.

A new continuous rod mill is described, recently installed at the Duisburg Works of the "Vereinigte Stahlwerke." The arrangement of the finishing stands is most unique and a departure from the methods applied so far in rolling rods. The finishing train is composed of 2 parallel trains each of 4 subsequent stands. The rolls of the finishing train are either horizontally or vertically arranged, so that the driving motors are placed above the stand in the case of the vertical stands. This mill permits rolling bundles, 200 kg. in weight of a rod 4½ mm. in diameter (about #7 rod). That is the largest output possible. The new mill is claimed to offer the big advantage of rolling an absolutely round rod. GN (12c)

Problems and Organization of a Production Division in a Rolling Mill. (Aufgaben und Organisation eines Arbeitsbüros im Walzwerk.) OTTO BEYER & PETER ZAHN. *Stahl und Eisen,* Vol. 52, Feb. 25, 1932, pages 181-189.

Report 92 of Rolling Mill Committee and Report 55 of Committee on Economy of Operation of Verein deutscher Eisenhüttenleute. Includes discussion which deals, in addition to present article, with K. Wiecke's article published in *Stahl und Eisen,* Vol. 52, pages 77-84 (1932). Real defect of rolling mill organization in past was frequent appearance of disorder, insecurity and uncertainty in estimate of classes of materials, brands, sizes, etc. Chief problems of production division appear to be: (1) preliminary estimate of sizes, brands, shapes, etc.; (2) preparation of order; (3) preparation of work. Tasks of production section are all clearly illustrated and expedients employed to get results, such as cards, charts, etc. are described. Finally a general plan illustrates connection between order and production preparation. DTR (12c)

Rolling Industry Attends to Precision in Mill Control. *Steel,* Vol. 90, Jan. 4, 1932, page 158.

A résumé of the many applications of automatic control equipment met with in the various phases of modern rolling mill practice. JN (12c)

Leading and Return Guide Devices for Rod and Wire Mill Stands. (Umführungen und Rückführungsvorrichtungen an Stab-und Drahtstrassen.) EMIL KÄSTEL. *Stahl und Eisen,* Vol. 52, Mar. 24, 1932, pages 287-289.

Description and illustration of operation of leading and return guides for both roughing and finishing stands in rod and wire mills. Equipment manufactured by Firma Fried. Krupp Grusonwerk. Akt.-Ges. These guides not only automatically displace rollermen used for introducing rod into various mill passes, but they help to keep uniform drawing speed throughout a mill stand. Each stand, roughing and finishing, is made practically automatic and continuous. DTR (12c)

Resistance to Deformation and Flow of Metal in Rolling. Part III. ERICH SIEBEL. *Rolling Mill Journal,* Vol. 5, May 1931, pages 363-368.

Abstract translation of a report of the Rolling Mill Committee of the German Iron and Steel Institute. See *Metals & Alloys,* Vol. 2, Nov. 1931, page 270. The author compares his results on resistance to deformation with the work of J. Puppe and analyzes the data of E. Siebel on the spreading of hot rolled metal at various temperatures, and the data of A. Falk on the evaluation of spread tests. The causes of acceleration are discussed and a summary of the author's studies are given in detail. JN (12c)

Shaping in the Plastic State. (Die Formgebung im bildsamen Zustand.) E. SIEBEL. Verlag Stahleisen, Düsseldorf, 1932. Cloth, 8½x12 inches, 91 pages. Price 12 RM.

The theoretical foundations for the plastic deformation of metals by hot and cold-working are discussed. Mathematical formulae and geometrical representations of stress distribution are worked out. Much of the data has been published before, this volume being a general summary. The mechanism of deformation in rolling, drawing, extrusion, punching, deep drawing and tube rolling is discussed in detail.

The questions of energy required for deformation and of energy losses in the various operations, of rate of deformation and of the formation of internal cracks, are all given general discussion. The importance of lubrication of the material being worked is brought out in several connections.

So mathematical a treatise cannot be adequately abstracted. Much more emphasis has been put on the subject of this treatise in Germany than elsewhere. The references cited are, roughly, 100 in German, 4 in French and 1 in English. H. W. Gillett (12c)-B-

Roll Pass Design. Part XXVII. W. Trinks. *Rolling Mill Journal,* Vol. 5, Mar. 1931, pages 181-186, 189-190.

In rolling billets or semi-finished bars, straightness and absence of seams and cracks are all important. Billets are rolled on 3-high mills, on the roughing rolls of bar mills, and on continuous mills. The author illustrates and describes 3 types of 3-high billet mills and gives complete tables of data on rolls, passes and working characteristics of each. These mills differ from blooming mills in that more than one bar is rolled at a time. In one example, the passes are rolled alternately; in the other, 2; the passes are rolled one above the other. Continuous mills are best suited for the mass production of billets. For small production, billet rolls are usually of the diamond or gothic type. The author illustrates the design of the gothic pass, describes its construction, and discusses its theory, special features, applications, precautions and limitations. JN (12c)

Roll Pass Design. Part XXIX. W. Trinks. *Rolling Mill Journal,* Vol. 5, May 1931, pages 341-346.

Large finished squares, 1" to 4" on a side, are rolled in hand mills. Each pass is a roughing pass, a leader, and also a finishing pass. The bar is finished in any given pass by being passed through 2 or 3 times, with 90° turns between passes. The bar is finished slightly octagonal but contracts on cooling to a perfect square. This method is used only with short billets for small reductions at low rolling speeds. Another method, for larger production, employs a separate finishing stand and obtains greater reductions in the roughing roll. Slabs are rolled from semi-finished squares on the universal slabbing mill or on high-lift blooming mills. These require no roll design or only a very small amount other than the computation of the desired initial square section. JN (12c)

Roll Pass Design. Part XXX. W. Trinks. *Rolling Mill Journal,* Vol. 5, June 1931, pages 415-418.

A discussion of the 4 methods of rolling flat sheets. For average work, the use of continuous mills with edging rolls between the main stands is quite common. The flat and edging method of rolling uses stepped rolls and is applicable to flats of intermediate widths. Tongue and groove rolling is practiced where very close adherence to dimensions and uniformly clean, sharp edges are required. This method is used also for thin, wide flats such as sheet bars and hoops. Rolling on the diagonal corresponds to the method of rolling squares and is confined to flats having a side ratio of not over 2:1. This method is commonly used for tool steel. Wide flats are rolled on continuous mills with vertical edging rolls or by tongue and groove methods. JN (12c)

Roll Pass Design. W. Trinks. *Rolling Mill Journal,* Vol. 5, Aug. 1931, pages 535-538; Sept. 1931, pages 595-598; Oct. 1931, pages 655-658; Nov. 1931, pages 715-718, 745; Dec. 1931, pages 775-778, 792.

Methods of rolling hexagons, rounds and angles are discussed in these installments and the dimensioning of rolls for definite purposes explained. The factors to be observed in rolling of angles with unequal legs and of channels are also discussed. Ha (12c)

Electric Power is Regenerated by New Roll Train Drag. Arthur J. Whitcomb. *Steel,* Vol. 89, Oct. 12, 1931, pages 31-33.

See "Electric Regenerative Drag for Sheet Mills," *Metals & Alloys,* Vol. 3, May 1932, page MA 136. Ha (12c)

The Twin-Motor Drive for Main Rolls. H. H. Wright & H. E. Stokes. *Rolling Mill Journal,* Vol. 5, June 1931, pages 403-406.

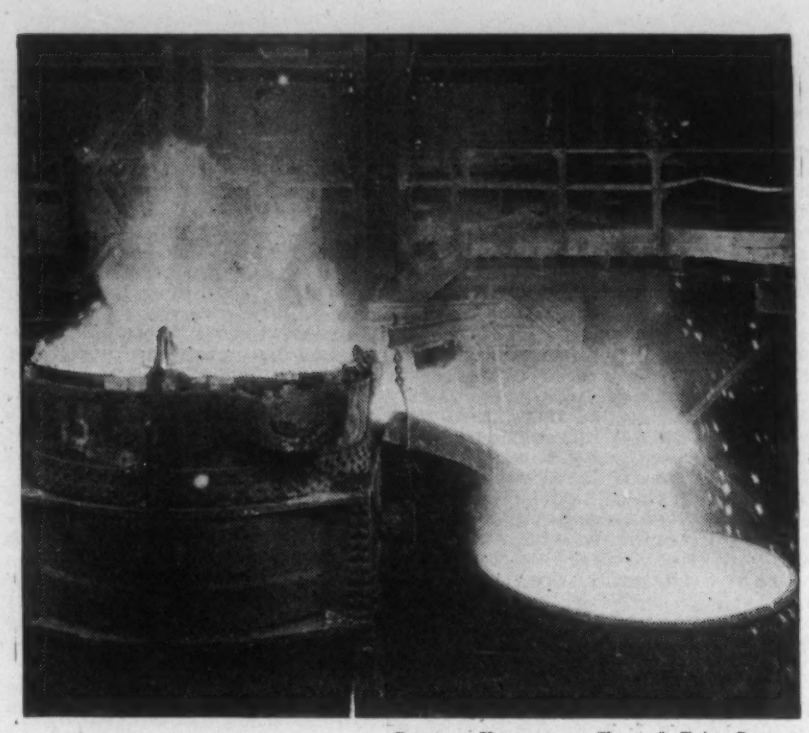
An abstract of a paper delivered before the Association of Iron and Steel Electrical Engineers, Cleveland, O., week of June 15. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 74. The electrical and mechanical arrangements of the twin motor drives for a 54" blooming mill and a 44" slabbing mill are described in detail and the advantages of the twin-motor drive for reversing service in wide strip mills are discussed. JN (12c)

Sheet and Tin Mill Developments during 1931. R. J. Wean. *Rolling Mill Journal,* Vol. 6, Jan. 1932, pages 25-26.

Improvements have been made in the design of mill tables used in connection with the "Combination System" of sheet and tin mills. To enable the sheets to be delivered substantially flatwise from the catcher to the feeder, the tilt point was placed at the extreme end. The tables are symmentrical about the center line of the mill, so that operators can work on either side of the mill. There is no chance of interference with other auxiliary equipment. MS (12c)

Production of Spring Wire from Soft Ingot Steel. (Herstellung von Springfederdraht aus weichem Flussstahl.) Hans Wiesecke. *Stahl und Eisen,* Vol. 52, May 5, 1932, pages 433-439.

This class of wire originally was called water-tempered or "Water wire" and the chief difficulty in its production in the past was that the product did not run uniform. A low C-steel, 0.055% C and 0.57% Mn, is recommended for obtaining a uniformly tempered product. Mn, which may be a trifle higher with still lower C, is a favorable addition. Increased amount of hardening may be obtained with rise of C to 0.12%, but a decrease in Mn with 0.12% C-steel is a necessity. Differences in hardening temperature, inasmuch as this lies above the A_3 point, are not appreciably altered by rate of cooling. In the cold drawing process physical properties of the wire are similarly affected, either from an original tempered or soft condition. The widely respected view that open-hearth steel is not suitable for producing good spring wire has been shown to be erroneous. Uneven tempering may be kept within limits, but not entirely eliminated. Placing a whole reel of wire into cooling water is an advantage and tends towards uniform and even temper throughout. Variations in strength of product may be lowered to a minimum by careful supervision, uniform furnace, rolling, and cooling water temperatures. Finishing temperature and rate of cooling vary with different wire sizes. Diameter of wire, ready for finish draw after tempering, should run from 5.3 to 6.5 mm. with tensile strength from 55 to 72 kg./mm.^{2} Diameter of product should be 3.8 mm. after cold roll reduction in 3 dies, with tensile strength of 95 to 110 kg./mm.^{2} Operating procedure in 8 mills includes data on chemical composition of suitable steel, both Thomas and open-hearth, type of reel, tempering temperature, water temperature. 27 references. DTR (12c)



Courtesy Youngstown Sheet & Tube Company

NIAGARA
BRAND
FERRO-ALLOYS

FERRO-SILICON
ALL GRADES

FERRO-CHROMIUM
HIGH CARBON

FERRO-CHROMIUM
LOW CARBON

FERRO-MANGANESE

SILICO-MANGANESE

PITTSBURGH
METALLURGICAL CO., Inc.
NIAGARA FALLS, N. Y.

DEFECTS (13)

Failures of Thin-Walled Tubes. (Fehler bei dünnwandigen Rohren infolge Herstellung oder Weiterverarbeitung.) W. RIDDE. *Die Röhrenindustrie,* Vol. 24, Jan. 1, 1931, pages 1-3; Jan. 15 1931, pages 15-16.

Describes how to reveal by metallographic investigation the manufacturing method of mild steel and low alloy steel tubular products. The difference between the seamless and welded tubes is mainly based on the detection of the seam and of P and S segregations respectively. If segregations are shifted into the weld due to shearing and sizing measures, failures in service are most likely to occur. Further violations of manufacturing rules are discovered by the occurrence of Fe_3C at the grain boundaries, indicating overannealing. Pipe holes may be detected by magnetic methods. Slag and other non-metallic inclusions and the appearance of segregation lines are readily discovered under the microscope. Mistakes during the further manufacturing processes refer to faulty threading of thin-walled tubes and to defective material from the dip-solder process. The use of higher C steel larger cross-sections and a temperature below 1050° C. are urged to prevent failures. The release of internal stresses before soldering should be insured. Welding is inferior to soldering in regard to vibration strength due to the properties of a casting of the first and the favorable thermal treatment of the latter joining method. EF (13)

The Production of Ferrous and Non-Ferrous Castings for High-Class Internal-Combustion Engines. S. WHITE. *Foundry Trade Journal,* Vol. 46, Mar. 17, 1932, pages 176, 179.

A general paper on the above subject, in which reference is made to troubles occasioned by the presence of cuprous oxide in main bearing castings. OWE (13)

Transverse Fissure Statistics. W. C. BARNES. Appendix C-2 to report of Rail Committee, *Bulletin American Railway Engineering Association,* Vol. 33, Feb. 1932, pages 567-572.

The trend of actual rail failures in track from transverse fissures has ceased to rise, being checked by the use of heavier rail sections, decrease in traffic and by the removal of rails found by the "Detector" cars to be in process of fissuring, before they actually fail. In 11 months of 1930 reported on, 5277 fissure failures occurred on the lines reporting, and 1434 were detected and removed before failure. Failures to the end of 1930 in the rollings of 1923 to 1927 show for all mills, an average of 4.54 fissure failures per year per 100 track miles, with one mill down to 0.43 and two mills up to 10.7 and 11.1. Correcting these by a factor for traffic density the average failures per year per unit of traffic density, still range from 0.43 to 10.2, for different mills with the average at 2.91. HWG (13)

Cores as Causes of Failure. (Wichtiges über Kerne als Ausschussursache.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Mar. 6, 1932, pages 104-105.

Cores cause failures of castings when they contain an excessive amount of binding material. It is shown in a few practical examples that failures were apparent when the above condition had not been fulfilled. GN (13)

Nature of Abnormal Grain Growth in High Speed Steel. G. R. BROPHY & R. H. HARRINGTON. *Transactions American Society for Steel Treating,* Vol. 19, Mar. 1932, pages 385-402.

Includes discussion. See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 45. WLC (13)

Non-Metallic Inclusions in Steel. J. C. BOOTH. *Journal Institute of Fuel,* Vol. 5, Feb. 1932, page 216.

Outline of the origin and effect of inclusions. There are 2 classes which command attention, oxides and sulphides, the oxides, which include the silicates, being the most important. Majority of inclusions found in ordinary commercial C steels are the products of deoxidation, the usual deoxidizers being ferromanganese and ferrosilicon. Mn is incapable of completely deoxidizing steel and if a killed steel is desired Si must be added. With low-C steels it is almost impossible to kill the steel and keep it clean. For this reason, deep drawing sheet steel is only semi-killed or not even killed at all. Very little definite information is available regarding the effect of inclusions on physical properties. They are not harmful in all cases. Free-cutting laminated spring steel and Aston wrought iron are examples of their deliberate introduction. Steel required for high duty must be reasonably free from inclusions. MS (13)

A New Type of Inclusion in Cast Iron and Its Relation to Manganese and Silicon Content. F. J. COOK. *Transactions & Bulletin American Foundrymen's Association,* Vol. 2, Oct. 1931, pages 423-439.

See *Metals & Alloys,* Vol. 2, July 1931, page 136. CHL (13)

Brittle Fracture in Ductile Steels. B. P. HAIGH. *Iron & Steel Industry & British Foundryman,* Vol. 5, Nov. 1931, pages 53-54.

A single theory is presented to explain the occurrence of a brittle fracture in ductile steel. CHL (13)

Taking Care of Inclusions in Steel. C. H. HERTY, JR. *Iron Age,* Vol. 128, Dec. 17, 1931, pages 1573-1574.

An abstract of the 6th Campbell Memorial Lecture read before the American Society for Steel Treating at Boston. See "Non-Metallic Inclusions in Steel," *Metals & Alloys,* Vol. 3, June 1932, page MA 181. VSP (13)

An Interesting Swelling Phenomenon in an Aluminum Alloy. (Eine interessante Treiberscheinung bei einer Aluminiumlegierung.) O. GREGER. *Mitteilungen des Technischen Versuchsamtes in Wien,* Vol. 20, Nos. 1-4, 1931, pages 36-39.

A remarkable destruction was observed in a cube and a piece of Al sheet, both of the composition Al 55%, Zn 45%. Pb traces. After 9 years of storage they showed splitting and spalling. (13)

Bubbles and Pores in Metals and Welds. (Ueber Blasen und Poren in Metallen und Schweissen.) H. A. HORN & K. TEWES. *Autogene Metallbearbeitung,* Vol. 25, Mar. 15, 1932, pages 88-92.

Pores and hollow spaces are in most cases caused by the manufacture of the metal; air and other gases are enclosed and not fully removed. The different possibilities, influence of freezing velocity of the metal, chemical reactions, and in welding the electrode and the arc or the kind of gas used are discussed and the means for detection of pores are briefly described. Ha (13)

Forging Defects in Twist Drills. (Schmiedefehler an Schlangenbohrern.) R. MEEBOLD. *Glückauf,* Vol. 68, Apr. 2, 1932, pages 319-322.

Life of twist drills depends chiefly on proper choice of material, kind of shaping and heat treatment. Highly carburized tool steel of average analysis 0.7% C, 0.22% Si, 0.2% Mn, less than 0.04% P, less than 0.04% S, less than 0.07% P+S, is used. This material, thoroughly annealed, has tensile strength of 70 to 85 kg./mm.^{2} with minimum elongation of $\delta_{10} = 13\%$. Crystal structure should be fine grained and finely laminated pearlitic. In practice breaks occur in 3 main places of the drill: Position 1, at the square shank end inserted in chuck and directly below the band; Position 2, at shank end where the spiral is forced on the core; 3, in the center of the length of the drill. Samples of all types of defects were examined in the cable testing section of the Westphal Mine Laboratories. Sections were made and the drills fractured at defective points and examined. Breaks at 1 are called "tinges," a defect due to imperfect forging. Around the tinge there is heavy decarburization, which is attributed to oxidizing action of hammer scale. The hammer scale is closed up in the tinge in the form of slag. At position 3 breaks are apparently made during swaging. Utmost care in the forging process will avoid the defects. DTR+Ha (13)

Cracks and Defects in Wheel Rims. (Ueber Brüche an Radreifen.) ALFRED POHL. *Stahl und Eisen,* Vol. 52, June 2, 1932, pages 539-542.

In the unusually severe winter of 1928-1929 the wheel rims of locomotives and tenders on the Austrian railroads showed a large number of cracks. The problem was to determine if these cracks were a result of decrease in toughness of the steel at the low temperatures encountered. Tests of 8 broken rims showed 7 with tensile strength higher than 85 kg./mm.^{2} and notch toughness with the usual average value for steel used for the same purpose. Examination of structure showed the cracks to lie along the boundaries of the transcrystallization dendrite zones or to be due to gas blow holes. The rather strong dendritic formation and gas holes appeared to be the sole causes, while the low temperatures were of almost no influence in causing the cracks, except for the amount of decrease in toughness coincident with the low temperatures encountered. DTR (13)

Technical Defects in Pipe Lines. (Technische Mängel im Rohrleitungswesen.) K. GABLER. *Die Schmelzschweissung,* Vol. 11, Apr. 1932, pages 72-74.

The author repudiates the accusations made by another writer that the great losses sometimes experienced in gas lines have to be charged to welded pipe lines and enumerates a number of probable other sources of losses. If welds in pipe lines are made conscientiously they are among the most reliable joints. Ha (13)

Failures of Axles of Railway Cars. (Achsbrüche von Eisenbahnfahrzeugen und ihre Ursachen.) R. KÜHNEL. *Glasers Annalen,* Vol. 110, Feb. 15, 1932, pages 29-37; Mar. 1, 1932, pages 41-52.

Includes discussion. Most comprehensive investigations and observations by the German Federal Railway System on the failures of axles are reported. The number of the failures of axles is very low. GN (13)

The Cause of the Porosity of Cast Iron. (Die Ursache der Porosität von Gusseisen.) A. JAESCHKE. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Feb. 21, 1932, pages 79-80.

The author deals with 2 different types of porosity: (1) porosity due to holes, and (2) sponginess. The first type of porosity is caused by gases. Porosity can be caused by an unsuitable composition of the cast iron and improper casting temperatures. GN (13)

Overcoming Shatter Cracks in Rail Manufacture. I. C. MACKIE. *Canadian Chemistry & Metallurgy,* Vol. 16, May 1932, pages 141-142.

"Shatter cracks" may be fully eliminated by retarding cooling in the "black heat" range. They take place at comparatively low temperatures, the most dangerous at about 250° C. The hardness is unimpaired. The rails are kept in the cooling boxes until the temperature is within 30° C. of the outside atmospheric temperature. The time required for the slow cooling is usually about 24-30 hours. WHB (13)

Investigation of Cracking of 42 mm. Steel Rounds. J. PROCHOROW & A. BRAHUTA. *Domez* (Achievements of Metallurgy in USSR and Abroad), No. 9, 1931, pages 1-33. (In Russian.)

In making 0.20-0.40 C quality steel, scrap losses in the finished product amounted to 40-50% largely due to seams and cracks. Blooming mill losses were exceptionally high on account of ingots tearing between the rolls. Steel was made in 50 ton basic open-hearth furnaces. Investigation showed that the loss was connected with poorly conducted melting operation, defective roll design and improperly conducted rolling operation. Metallographic investigation indicated that most of the troubles were due to the rolling. By issuing detailed instructions for melting and teeming (given in the paper), redesigning the rolls and standardizing rolling practice the losses were reduced to normal. (13)

Causes of Bursting of the Pipes in Water Tube Boilers. (Note sur un element d'information intéressant la recherche des causes d'éclatment des tubes de chaudières aquatubulaires.) A. DELACOUR. *Annales des Mines,* Thirteenth Series, Vol. 1, 1932, pages 337-349.

Examination of many cases of boiler failures due to bursting of water pipes showed that the area adjoining the failure was often in quenched state instead of being annealed as was the rest of the tube. The possibility of quenching of low C steel in boiling water was investigated by heating the specimens to high temperatures and quenching them in boiling water. Structures resembling those observed on boiler tube fractures were produced. Local overheating to above the upper critical point followed by quenching by the escaping steam and water was suggested as an explanation. JDG (13)

Shrinkage and Gas Cavities. *Metallurgist,* Jan. 1932, pages 15-16.

A critical abstract of a paper by E. Scheuer on "The Formation of Shrinkage and Gas Cavities in Metals" in the Dec. 18, 1931 issue of *Metallwirtschaft.* See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 253. VVK (13)

CHEMICAL ANALYSIS (14)

The Determination and Separation of Rare Metals from Other Metals. XXI. The Determination of Rhodium and Its Separation from Platinum and Other Metals. (Die Bestimmung und Trennung seltener Metalle von anderen Metallen. XXI. Die Bestimmung des Rhodiums und seine Trennung von Platin und anderen Metallen.) LUDWIG MOSER & HANS GRABER. *Monatshefte der Chemie,* Vol. 59, Jan. 1932, pages 61-72.

Contains 74 references. Separation of Rh from Pt: Dilute the weakly acid solution containing $RhCl_3$ and H_2PtCl_6 to 300-400 cc. and add 30 cc. M/2 $NaBrO_3$. Heat to 70° and add from a pipette M/1 NaBr. Boil for 1 hour. Precipitation is complete if no Br forms when more bromate-bromide solution is added. Filter, wash and ignite. Heat the residue 15 minutes in a stream of H_2, then cool in CO_2. Boil the residue in dilute HCl, filter, wash and ignite as before. Weigh Rh. Determine the Pt with hydrazine chlorohydrate. Rh from Au: Use the same method as for Pt, except dilute solution to 800 cc. Rh from Cu: To the 200 to 400 cc. solution add H_2SO_4 to make it N/10 and $MgCl_2$ so that it contains 15 cc. M/10 $MgCl_2$ per 100 cc. solution. Heat to near boiling and pass in H_2S until it cools. Filter, wash and ignite. Treat the residue with 1:1 HNO_3 for 1 hour, decant and filter. Ignite the oxides, reduce them in H_2 and cool in CO_2. Leach out Cu twice with conc. HNO_3 and filter off Rh and wash. Ignite the residue, heat in H_2 and cool in CO_2. Wash with H_2O and weigh Rh. Determine the Cu in the filtrate electrolytically. Rh from Fe: To the 200 to 400 cc. solution containing the chlorides add HCl until it is N/7 to N/10. For every 100 cc. solution add 15 cc. M/10 $MgCl_2$, heat to boiling and pass H_2S through until the solution is cold. Filter, wash and determine Rh as before. Boil out H_2S from filtrate, oxidize the Fe and determine by double precipitation with NH_4OH. Rh from Pb: Add H_2SO_4 to the solution contained in a porcelain dish and evaporate to fumes. No reddish brown $Rh_2(SO_4)_3$ should form. Dilute and decant through a Gooch crucible. Add 2 N H_2SO_4 to the precipitate and allow to stand for several hours. Decant and filter through the Gooch crucible and wash with 96% alcohol. Ignite at a dull red heat and weigh $PbSO_4$. Evaporate the filtrate almost to dryness and determine Rh by the sulphide method. CEM (14)

Micro-Chemical Methods in Metallurgy. (Mikrochemische Methoden in der Metallkunde.) M. NIESSNER. *Die Metallbörse,* Vol. 21, June 27, 1931, page 1206.

Methods are discussed for detecting traces in metals and alloys by micro-chemical work referring to Ni, Co, Cu + Ni, Cu + Ni + Co, S and P segregations, and non-metallic inclusions. Paper before the 68th General Meeting of the Deutsche Bunsengesellschaft für angewandte physikalische Chemie, Vienna, 1931. EF (14)

The Quantitative Micro-Analytical Determination of Carbon and Hydrogen. (Ueber die quantitative mikroanalytische Bestimmung des Kohlenstoffes und Wasserstoffs.) A. FRIEDRICH. *Die Metallbörse,* Vol. 21, Aug. 12, 1931, page 1518.

A new laboratory equipment for the micro-determination of H_2 and C in an O_2 current was developed including: absorption apparatus according to Pregl except stop cocks, flow meter as a substitute for the previously used pressure regulator and a U-tube instead of a bubble counter. The Mariott bottle is also abandoned. Paper at the 36th General Meeting of the Verein Deutscher Chemiker, 1931. EF (14)

Solid Gold Hydride. (Festes Goldhydrid.) E. PIETSCH & E. JOSEPHY. *Die Naturwissenschaften,* Vol. 19, Aug. 28, 1931, page 737.

Solid Au hydride was secured by treating pure Au (1000/1000) with atomic hydrogen. Chemical detection is given. EF (14)

Application of Optical Spectroscopy to the Determination of Heavy Elements in Tissue. WINIFRED MANKIN. *Chemical Engineering & Mining Review,* Vol. 24, Jan. 5, 1931, pages 142-144.

A series of experiments are described that are aimed to obtain a complete analysis of the heavy elements of tissue. An arc circuit was found to be most satisfactory to obtain an emission spectrum for the work. WHB (14)

Analysis of Oxygen in Steel. Correspondence from A. PORTEVIN. *Metal Progress,* Vol. 21, Apr. 1932, pages 73-75.

The 2 methods most favored by the writer for the determination of O_2 in steel are by reduction with monoxide in vacuo with carbon, and by determination of alumina and silica after volatilization with chlorine. WLC (14)

Determination of Arsenic in Iron Ores, Melts and Steels. (Détermination de l'Arsenic dans les Minerais de Fer, Fontes, et Aciers.) C. MISSON. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 194-195.

The method used is based on the precipitation of As by reduction by means of sodium thiosulphate, redissolving the precipitate of As obtained, and finally weighing the product which is ammonium arseno-molybdate. MAB (14)

Standard Methods for the Sampling and Analyzing of Aluminum and Certain Aluminum Alloys. Aluminum Research Institute, 1932, 24 pages.

Loose leaf instruction book for determining Cu, Fe, Pb, Mg, Mn, Ni, Si, Sn and Zn in Al. (14)-B-

Determination of Molybdenum in Vanadium Steels. (Dosage du Molybdène dans les Aciers Renfermant du Vanadium.) EDMOND ROUSSEAU. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 188-193.

The author concludes that if in place of using NaOH one uses Na_2CO_3 to separate Fe with Mo and V, the solution is easily diluted; all the V remains with the Fe and the Mo completely passes into solution and can then be determined correctly by a usual method. The method used for precipitation and ignition of the precipitate of Pb molybdate always gave correct results. The colorimetric determination of Mo, based on the more or less white coloration produced in a cold, dilute solution by the colloidal precipitate of Pb molybdate, permits the correct determination of very small quantities of Mo in steel, even in the presence of relatively large quantities of V. The procedure of separation described is superior to most others since it permits. (1) separation of Mo in the presence of V; (2) control of the purity of the final products, $PbMoO_4$ and MoO_3; (3) separate determination of the 2 metals in the same operation. MAB (14)

The Iodometric Determination of Chromium and Its Separation from Iron and Nickel. (Beiträge zur jodometrischen Bestimmung des Chroms und Trennung desselben vom Eisen und Nickel.) E. SCHULEK & A. DOZSA. *Zeitschrift für analytische Chemie,* Vol. 86, No. 1-4, 1931, pages 81-82.

To 20 cc. of cold Cr^{+++} solution add 2-5 cc. of freshly saturated Br water and 10 cc. of 30% NaOH. Heat until the solution begins to boil and then remove the flame. This suffices to accomplish complete oxidation of the Cr^{+++} to CrO_4^{--}; further heating might cause BrO_3^- to form. To the well-cooled solution add 5 cc. of 5% phenol solution to remove the excess Br_2. Transfer to an Erlenmeyer flask which is provided with a tightly fitting stopper and dilute to 400 cc. Add 4 g. of $KHCO_3$ and 25 cc. of 50% H_2SO_4 in small portions, watching to see if the greenish yellow color of the solution assumes a reddish tinge. Unless care is taken in this acidification, there is sometimes a little Br_2 formed by the reaction between CrO_4^{--} and Br^- and the liberated Br_2 will react with the phenol present. Add 2 g. KI and any remaining portion of H_2SO_4. After 5 min. titrate the liberated I_2 with 0.1 *N* $Ha_2S_2O_3$. If Fe is present it is best to filter off the $Fe(OH)_3$ precipitate, dissolve it in acid and treat the resulting solution with NaOH and Br_2 again. Sometimes even a third treatment is necessary. If only a little Fe is present, it can be disregarded. When Ni is present, there is danger of Br being converted into BrO_3^-, so that after the removal of the $Ni(OH)_3$ precipitate it is necessary to make the solution strongly acid with H_2SO_4, boil to decompose any BrO_3^- and then repeat the treatment with Br_2 and NaOH. The results of numerous experiments are tabulated; they indicate that this oxidation with Br_2 is better than the treatment with H_2O_2 so often employed. Ha (14)

Simultaneous Determination of Sulphur and Carbon in Steel. (Gleichzeitige Bestimmung von Schwefel und Kohlenstoff im Stahl.) ADOLF SEUTHE. *Stahl und Eisen,* Vol. 52, May 5, 1932, pages 445-446.

Apparatus illustrated and described for making rapid and simultaneous volumetric analysis of S and O in steel. Accuracy of C determinations is same as by other similar methods and that of S determination is of the order ± 0.002%. DTR (14)

Lithium Chloroplatinate and the Separation of Potassium from Sodium and Lithium by the Unmodified Original Fresenius Method. G. FREDERICK SMITH & A. C. SHEAD. *Journal American Chemical Society,* Vol. 53, Mar. 1931, pages 947-957.

The preparation of Li chloroplatinate suitable for a reagent in the precipitation of potassium is described. Potassium chloroplatinate is precipitated if the above reagent is used in place of chloroplatinic acid, with 80% ethyl alcohol as solvent. This precipitate is stable at 200°-260° C. MEH (14)

The Selenious Acid Method for the Determination of Zirconium. STEPHEN G. SIMPSON & WALTER C. SCHUMB. *Journal American Chemical Society,* Vol. 53, Mar. 1931, pages 921-933.

Zr is quantitatively precipitated as basic selenite by excess selenious acid from solutions, the acidity of which should not be greater than 0.6 *N*. The method is given in detail with procedure for the treatment of other metals commonly found in a Zr mineral. It gives satisfactory results even when all of such elements as Th, ceric Ce, Ti, V, Fe and U are originally present. A rapid method for decomposing Zr ores preparatory to making the analysis, is also given. MEH (14)

Determination of Minute Quantities of Mercury and Its Significance. (Die Bestimmung kleinster Quecksilbermengen und ihre Bedeutung.) A. STOCK. *Die Naturwissenschaften,* Vol. 19, June 5, 1931, pages 499-502.

The effect of Hg traces on the organism and detection of 10^{-8} g. Hg by colorimetric methods. Several determinations were made on laboratory reagents, foodstuffs, organic matter, etc. The absorption of spilled Hg by active charcoal soaked with I is recommended. EF (14)

Colored Reaction of Molybdenum. Application to the Colorimetric Determination of Molybdenum in Steels. (Reaction Coloree du Molybdene. Application au Dosage Colorimetrique du Molybdene dans les Aciers.) ERNEST BERTRAND. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, page 198.

The principle involved is as follows: if one adds a solution of $SnCl_2$ to a HCl solution of Mo containing W, which is held in solution by means of H_3PO_4, one obtains a color varying from light blue to deep violet-blue according to the quantity of Mo present. The specific technic as applied to determination of Mo is given fully. If V is present, it must be removed before making the Mo reaction. The method detects as little as 0.01 mg. Mo (which equals 1 part in 8,000,000). MAB (14)

Spectroscope Permits Rapid Estimation of Alloying Elements in Steel. *Steel,* Vol. 90, Jan. 18, 1932, page 31.

The Spekker Steeloscope is a special type of spectroscope developed by Adam Hilger, Ltd. for the rapid estimation of alloying elements in steel. An electric arc is set up between the specimen to be examined and an iron rod. The light rays from this arc are then resolved into their spectral lines by a system of prisms and the presence and relative proportions of other elements present with the iron estimated by visual inspection and comparison of the spectral lines with a series of reference diagrams. It is possible to determine Ni, Cr, Mo, Mn, Ti, W, Co, Cu, Sn, Cd and V to an accuracy of 0.5%. JN (14)

Rapid Iodometric Determination of Copper in Antifriction Alloys. (Dosage Rapide du Cuivre dans les Alliages Antifriction par Iodometrie.) E. BERTRAND. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, page 199.

The determination of Cu in antifriction alloys by the iodometric method is based on the principle that I freed by the action of Cu on KI, under conditions determined by the acidity, is titrated by a hypo-sulphite solution to which one adds a slight excess. This excess is titrated back by a solution of I in the presence of starch paste. MAB (14)

A Method for the Determination of Cobalt in Magnet and High-Speed Steels. JAMES I. HOFFMANN. *Bureau of Standards Journal of Research,* Vol. 8, May 1932, pages 659-668.

A method for the accurate determination of Co in steel is described. WAT (14)

On Electrometric Titration. (Über die elektrometrische Titration.) *Die Metallbörse,* Vol. 22, Feb. 3, 1932, pages 145-146; Feb. 10, 1932, pages 177-178.

Outlines the present state of the electrometric titration, discusses the underlying principles, describes the methods of analyses with particular reference to the determination of metals, and urges wider adoption in commercial laboratories due to its remarkable potentiality. 14 references. EF (14)

The Analysis of Residues of Alloy Steels by Chlorination. (Lässt sich die Rückstandsanalyze durch Chloraufschluss auf legierte Stahlsorten anwenden?) R. Wasmuht. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 5 pages.

See *Metals & Alloys,* Vol. 2, May 1931, page 107. Ha (14)

Determination of Iron Oxide in Liquid Steel. C. H. Herty, Jr., Hyman Freeman & M. W. Lightner. *Report of Investigations* No. 3166, *United States Bureau of Mines,* Apr. 1932, 10 pages.

Al is added to steel in a test spoon, the killed steel poured into a suitable mold, and the metal analyzed for Al_2O_3, from which the FeO in the steel may be calculated. When the metal has been deoxidized with Mn or Si, the SiO_2 is reduced by Al to about 0.006%, and it would be expected that almost all of the MnO would be reduced. The true FeO content is therefore not determined. If these inclusions are extracted electrolytically, it is possible to correct for SiO_2 and MnO. All slag must be removed from the surface of the steel in the spoon, as otherwise Mn and P are reduced. Slag used to coat the spoon has no effect. See also *Metals & Alloys,* Vol. 1, June 1930, page 568. AHE (14)

The Spectrographic Assay of Gold, Platinum and Silver, and of the Ores Containing the Same. *Mining Journal,* Vol. 177, Apr. 2, 1932, page 218.

A brief review of the literature. AHE (14)

The Determination of Zinc by Electrometric Titration. (Dosage Electro-titrimétrique du Zinc.) Edm. Leclerc. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 169-172.

The author comes to the conclusions that if the electrotitrimetric determination of Zn as he conducted the test, gives correct results in spite of the fact that ammonium salts in a solution of Zn are present, it is because he used 2 electrodes, both of which change color when different equilibria occur. He measured the true intensity of the current resulting from the difference in potential between the electrodes, being sure that the current stopped at the end of the test. This method reduces the chances for error to a minimum because of the rapidity with which it can be carried out. MAB (14)

Investigations on the Determination of Tungsten by Gravimetric and Volumetric Methods. (Recherches sur le Dosage du Tungstene par Voie Gravimétrique et Titrimétrique.) George Dotreppe. *Chimie et Industrie,* Vol. 25, Special Number, Mar. 1931, pages 173-178.

Reduction of tungstic acid by Zn and HCl did not give a composition derived from trivalent W. The products obtained corresponded to a complex oxide, W_4O_7, of which no trace has been found in the literature. The author is uncertain whether or not it is a combination of the two oxides, W_2O_3 and W_2O_4. In either case, the method described for determining W by titration gives very satisfactory results, and, moreover, permits the determination of W in the presence of phosphates which is hardly possible by gravimetric methods. MAB (14)

Separation of Cadmium from Zinc by H_2S. Leo Baumeister. *Chemist-Analyst,* Vol. 21, May 1932, pages 7-8.

Precipitation of CdS is easier from solutions containing H_2SO_4 than HCl and can be hastened by addition of a little NH_4OH as a starter. Red CdS is precipitated when H_2S is passed slowly in fairly acid, hot solutions. It filters rapidly and is to be preferred for fairly large amounts of Cd. Yellow CdS is precipitated when H_2S is passed rapidly in cold, weakly acid solutions. It is finely divided and filters slowly, but comes down fast and is preferable when the Cd content is low. A concentration of 4 cc. H_2SO_4 in 100 cc. solution produces a complete separation of small amounts of Cd from large amounts of Zn, but if the Zn content is very high a double precipitation is necessary. It is most convenient to finish the Cd determination by electrolysis in a slightly alkaline solution containing a little KCN at 1 to 1.5 amps. on Cu plated Pt electrodes. CEM (14)

The Determination of Cadmium in Sulfide Zinc Ores. Archibald Craig. *Chemist-Analyst,* Vol. 21, May 1932, pages 8-11.

Occlusion of Cd by the residue insoluble in H_2SO_4 is prevented by this method and the correct conditions for H_2S precipitation are used. To a 10 g. sample add 100 cc. hot H_2O and 25 cc. HNO_3 in 3 portions, then 40 cc. 1:1 H_2SO_4. Evaporate to slight fumes, dilute to 350 cc. and boil gently for 1 hour. Add 10 g. $(NH_4)_2SO_4$ and pass in H_2S rapidly for 15 min. Filter and wash. Dissolve precipitate and paper in 10 cc. HNO_3 and 10 cc. H_2SO_4. Heat to fumes and add dropwise 1 to 5 cc. HNO_3. Continue heating with HNO_3 additions until organic matter is destroyed and HNO_3 expelled. Dilute, boil and filter. Repeat the acid treatment of the residue twice using 10 cc. H_2SO_4, combining the first two filtrates. Add to these 15 cc. NH_4OH and dilute to 300 cc. which should produce 4% acidity. To the third filtrate add 10 g. $(NH_4)_2SO_4$, dilute to 250 cc. and pass H_2S into both solutions. If no CdS is found in the third filtrate proceed with first two filtrates alone. Filter CdS and dissolve in 10 cc. H_2SO_4 and HNO_3 as before. Add 10 g. $(NH_4)_2SO_4$, dilute to 250 cc., pass in H_2S and filter. Test filtrate for Zn. Dissolve CdS as before, add an excess of NH_4OH and $(NH_4)_2CO_3$ and boil. Filter if necessary. Add a slight excess of NaCN to the filtrate and pass in H_2S. Let stand over night. Filter through pulp without washing. Dissolve the CdS as before using 5 cc. H_2SO_4. Evaporate without boiling to remove all free H_2SO_4. Cool, dilute and add 1 g. NaCN. Electrolyze with .1 amp. with fixed electrodes for 2 hours. Wash in alcohol, dry and weigh Cd. CEM (14)

The Potentiometric Determination of Iridium. Sho-Chow Woo & Don M. Yost. *Journal American Chemical Society,* Vol. 53, Mar. 1931, pages 884-888.

The data show that the new titanous chloride titration method of determining iridium gives results in agreement with those given by the earlier iodometric method, which was refined by using benzene to detect the liberated iodine. The results of both methods are in agreement with the gravimetric. MEH (14)

Quantitative Spectral Analysis of Alloys. (Zur quantitativen Spektralanalyse von Legierungen.) H. Töpermann & W. Shuhknecht. *Zeitschrift für analytische Chemie,* Vol. 86, No. 1-4, 1931, pages 160-174.

2 simple contrivances are shown by means of which the picture of the logarithmic sector of the spectral lines is provided with marks so that the lines can be evaluated without other measurement. A wedge photometer is also described which is useful for evaluating spectrograms, and the reproducibility attainable is shown by a large number of measurements. The influence of various kinds of electrodes is discussed; electrodes with surfaces roughened by use require longer times of exposure than electrodes with polished surfaces. 20 references. Ha (14)

Quantitative Determination of Copper in the Acid Copper-Bath (Massanalytische Bestimmung des Kupfers im sauren Kupferbad). K. Altmannsberger. *Oberflächentechnik,* Vol. 8, Oct. 6, 1931, page 207.

An iodometric method and a method using Rh are described which require only 10 cc. of the solution. Both methods are very sensitive and take only a few minutes. Ha (14)

Quantitative Optical Spectral Analysis of Lead Alloys. (Quantitative optische Spektralanalyse von Bleilegierungen.) A. Guenther. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 200, Oct. 14, 1931, pages 409-418.

Homologous pairs of spectral lines were determined for the systems Li, Cu, Zn, Au, Te and Bi in Pb and also of Ag in Sn which can be very well used for optical determination. Tables of the numerical values are added. Ha (14)

On Micro Chemistry. (Über Mikrochemie.) F. Emich. *Die Metallbörse,* Vol. 21, Aug. 12, 1931, page 1517.

The speaker before the Verein Deutscher Chemiker, 1931, aims at 2 goals: (1) to give a bird's eye view of the evolution and present state of micro-chemical determinations and (2) to focus attention on some problems which need further research work along micro-chemical lines. EF (14)

Problems of Quantitative Chemical Spectral Analysis. (Aufgaben der quantitativen chemischen Spektralanalyse.) W. Gerlach. *Die Naturwissenschaften,* Vol. 19, Jan. 9, 1931, pages 25-28.

The significance of the spectral analysis is stressed when only minute quantities of the sample are available and when contaminations are present at extremely low concentrations, so that chemical analysis fails. After outlining the underlying principles of the method, the writer discusses the limits of detection which do not only depend on the light intensities but also on the kind of light excitation. The limit is given to be around 1/1000 atomic %. The minimum amount of the sample requisite for spectral analysis depends on several factors and amounts to 10^{-7} to 10^{-9} g. in case of electro-deposited metals. A special chapter takes up the problem of "local analysis" and describes the investigation of Au, Ag and Pt material of wearing industry, in which Pt-metals, contaminations from hard solders and crucibles could be proved. Analysis of refractory linings revealed Mg, Sr, Ca and appreciable amounts of V. Pb up to 0.04% renders Au brittle due to the occurrence of a brittle Au-Pb compound at the grain boundaries. Cu + Ag additions result in an accumulation of Cu + Pb at grain boundaries. The testing of metals in a highly pure state by spectral analysis is emphasized in the next chapter. The absence of Fe was proved in pure Cu, Au and Ag, but was never insured in Pt although being distributed very irregularly. The detection of Bi in Pb for storage batteries goes as far as 10^{-4} atomic %. The investigation of Pt metals showed their relative impure state and the examination of pure Ni disclosed the presence of C. The chemical analysis of a Ag sample stated its absolute purity, but spectral analysis revealed traces of Au, Si, Sn, Zn and Th. Furthermore the spectral analysis furnishes a means of checking deviations of atomic weight determinations. The investigation of Ca showed the presence of appreciable amounts of Sr. A special chapter is devoted to the detection of Hg. Traces of this metal are either electro-deposited on Sn or chemically precipitated with Cu artificially added. In the deposition and precipitant quantities as low as 7×10^{-8} g. of Hg can be detected. EF (14)

Determination of Tin in Tin Pyrites in the Presence of Cassiterite. (Bestimmung von Zinn im Zinnkies bei gleichzeitigem Vorhandensein von Cassiterit.) Bruno Hirsch. *Chemiker-Zeitung,* Vol. 56, Feb. 13, 1932, page 127.

3 methods are given. (1) Fuse 1 g. sample with Na_2O_2 and dissolve melt in HCl. Reduce the Sn with Fe or Ni, filter and titrate with standard iodine solution. The result gives the total Sn content. To another 1 g. sample add 10-15 cc. 63% HNO_3, boil and add 30 cc. 38% HCl. Warm for 1 minute and dilute with 50 cc. hot H_2O. Filter and wash 4 times with hot 5% HCl. Ignite and fuse the residue with Na_2O_2 and finish the same as the first sample. This result gives the Sn present as cassiterite. (2) To the filtrate from the second sample in the first method add an excess of NH_4OH, filter, wash and ignite. This result gives the Sn present as tin pyrites. (3) To a 1 g. sample add 10 cc. HNO_3 and evaporate to dryness. Cool and add 10 cc. of a solution consisting of 2 g. Br and 100 cc. 30% HCl. Evaporate to dryness and warm with 50 cc. 30% HCl. Dilute to 250 cc. and add 1 g. of pure Fe and 2 Swedish horseshoe nails. Boil for 30 minutes, cool without filtering and titrate with standard iodine solution. This result gives Sn present as tin pyrites. CEM (14)

HISTORICAL & BIOGRAPHICAL (15)

Michael Faraday Actually Made Stainless Steel. ARTHUR LAMSLEY. *Heat Treating & Forging,* Vol. 17, Dec. 1931, pages 1105-1106.

At the recent Michael Faraday Centenary Celebrations in London, Sir Robert A. Hadfield presented results of his investigation of the steels and alloys made by Faraday during 1819 to 1824. These establish beyond doubt that Faraday is the pioneer of alloy steels. Sir Robert was given permission to examine the contents of a box stored in the basement of the Royal Institution. The box was labelled "Steel and Alloys" and contained 79 specimens, having a total weight of 7 lb. 14 oz. Analysis of these specimens showed presence of Cr, Cu, Au, Ni, Pt, Rh, and Ag. Pd was found in a specimen lent by the Science Museum, London. Some of the alloys were of low C content, *e.g.* 0.16, 0.12, 0.10, and 0.07% C. Physical tests were also made. These indicated that Pt to a slight extent, and Ni and Au to a more marked degree, improve the tensile properties of C steel, while Rh affected them adversely. MS (15)

Three Centuries of German Metal Plastic Art. (Deutsche Metallplastik aus drei Jahrhunderten.) WILHELM PINDER. *Stahl und Eisen,* Vol. 52, Mar. 17, 1932, pages 257-262.

Historical sketch of German metal plastics in 16th, 17th and 18th centuries with illustrations representative of various periods. Trend in Germany from beginning of plastic work has always been towards use of metals. DTR (15)

Early Chemistry and Chemists in the Iron and Steel Industries of America. L. W. SPRING & L. E. GILMORE. *Metals & Alloys,* Vol. 3, Feb. 1932, pages 40-42.

The authors sketch the history and personalities of the development of the iron and steel industry and its chemistry. WLC (15)

Early Babylonian Jewelry. SIDNEY SMITH. *Brass World,* Vol. 28, June 1932, pages 115-116.

Babylonian metal workers did interesting and intricate metal casting and forming as far back as 3500 B. C. WHB (15)

Collecting and Filing of Corrosion Literature. (Sammlung und Sichtung der Korrosionsliteratur.) W. WIEDERHOLT. *Korrosion und Metallschutz,* Vol. 8, Feb. 1932, pages 35-46.

This paper before the Reichsausschuss für Metallschutz 1931, furnishes directions on efficient filing methods of the extensive corrosion literature, the information on which is partly scattered in text-books, theses, patents and partly among reports and publications under all kinds of head lines. In 1929 for instance, 55 books, dissertations, etc., 1900 original articles in 333 domestic and foreign magazines and 572 international patents were filed in a subject and author index. It is estimated, that in summary 25,000 publications on the subject are available at the present time. The necessity for convenient filing is evident. The speaker suggests the use of a filing method which includes an author and a subject index on differently sized cards. Patents should be filed by numbers and not alphabetically according to the inventor. The speaker's proposals on the subject index are based on the following classification: (1) Corrosion A) material, 1) metals, 2) non-metallic materials. B) corrosion media 1) chemical reagents, 2) commercial fields. (II) Corrosion Protection A) General, C) surface treatment, D) additions to the liquid medium (inhibitors), C) additions to the alloys or material, D) impregnations, E) electrolytic protection, F) special methods. (III) Miscellaneous, A) Notion conception "corrosion," B) economic and commercial questions, C) statistics, D) books, E) reports of societies, F) trade names. Based on experiences gained on surveying the corrosion literature during a long period of time, further subdivisions (up to five) of the three main groups are discussed and presented in detail. EF (15)

One Hundred Years of Blast Furnace Gas Utilization. (100 Jahre Hochofengasverwertung.) H. DICKMANN. *Stahl und Eisen,* Vol. 52, May 26, 1932, pages 513-514.

Historical sketch of original use of blast furnace gas in the foundry and mill. The name Faber du Faur is synonymous with the beginning of blast furnace gas utilization in the year 1832. DTR (15)

Christopher Polhem and Rolling Mill Practice. (Christopher Polhem und das Walzwerkswesen.) H. GRAUMANN. *Stahl und Eisen,* Vol. 52, Mar. 10, 1932, page 243.

Condensed historical sketch of original rolling mill practice in 17th-18th century as developed by Christopher Polhem, Swedish mechanical engineer. Abstracted from Christopher Polhem, Minnesskrift utgifven an Svenska Teknologföreningen (Stockholm 1911: Centraltryckeriet). DTR (15)

Laboratory Methods Yesterday and Today. J. T. DONALD. *Canadian Chemistry & Metallurgy,* Vol. 16, May 1932, pages 121-122.

One of a series of historical sketches on "Chemistry in Canada." WHB (15)

The International Material Testing Congress in Zurich, 1931, and the Development of Material Testing up to the Present. (Der Internationale Materialprüfungskongress in Zürich 1931 und die bisherige Entwicklung der Materialprüfung.) OTTO HOENIGSBERG. *Mitteilungen des technischen Versuchamtes in Wein,* Vol. 20, Nos. 1-4, 1931, pages 30-36.

An interesting historical review is given of the development of the arts and artisanship in metals; in olden times the craftsmen knew his material and its properties so well as to get the best performance in use and fine decorative effects. Systematic material testing dates from about Galileo, Mariotte, Reaumur and finally the scientific period beginning in the last quarter of the 19th century with Bach. The present status of the comparative importance of tests to which materials are subjected is discussed with special reference to the convention in Zurich. Ha (15)

Notes on a Research on Faraday's Steels and Alloys. ROBERT HADFIELD. *Engineering,* Vol. 132, Oct. 2, 1931, page 440.

Abstract of paper read before Section G of the British Association for the Advancement of Science, Sept. 24, 1931. See *Metals & Alloys,* Vol. 3, July 1932, page MA 221. LFM (15)

Origin of the Word Sonim. Correspondence from H. D. HIBBARD. *Metal Progress,* Vol. 21, Apr. 1932, page 68.

Writer explains the origin of the coined word "sonim" used as substitute for the cumbersome phrase "solid nonmetallic impurities." WLC (15)

Ancient Water Supplies. JAMES W. ARMSTRONG. *Water Works Engineering,* Vol. 85, Jan. 13, 1932, pages 18-20.

Interesting account of the water supplies and distribution systems of the ancient countries. Large quantities of lead pipe were used by the Romans. CBJ (15)

Some Bronze Specimens from the Royal Graves at Ur. C. F. ELAM. *Institute of Metals, Advance Copy* No. 589, Apr. 1932, 8 pages.

Bronze specimens which were probably made between 2600 and 3500 B.C. were examined. All contained small amounts of Ni, and some contained Sn. All specimens were covered with a heavy layer of corrosion products. There was an outer green layer, probably malachite, a layer of Cu_2O, and a black layer adjacent to the metal. The composition of the black layer could not be determined, although lines from the Cu_2O phase were observed in X-ray patterns from this material. Microstructures indicated that some of the specimens were in the cast condition, and that some of them were wrought. The wrought alloys were not as badly corroded as the cast. 3 references. JLG (15)

Brinell, Rockwell, Shore or Monotron Hardness? (Brinell, Rockwell, Shore oder Monotron Härte) E. IRION. *Die Metallbörse,* Vol. 21, May 2, 1931, pages 819-820; May 9, 1931, pages 867-869.

The historical review of the hardness testing methods refers to the contributions of Brinell, Ludwig, Shore, Wüst and Bardenheuer, Baumann, Rockwell, Martens, Vickers, Herbert, Morin and Poldihütte, Schwarz. EF (15)

History and Developments in the Art of Welding Ferrous Metals. A. J. MOSES. *Combustion,* Vol. 3, Feb. 1932, pages 38-44; Mar. 1932, pages 26-30; Apr. 1932, pages 28-33; May 1932, pages 7-14.

A series of articles in 4 parts dealing with welding art. In Part I the author reviews the history of welding and begins discussion of the forge welding process with hammer welding. Part II continues the forge welding discussion with roll and resistance welding. Fusion welding is begun in the last section of Part II, and is concluded in Parts III and IV. The writer is an authority on the subject, especially in the field of fusion work and has made extensive studies in the history of the art. A diagrammatic classification is given of the principal welding processes. All welding process techniques are described and their application, pros and cons indicated. Chapters on acetylene process, carbon arc and metallic arc welding are through. The most important factor in obtaining deposited metal of desired properties in electric-arc work appears to be the shielding and protection of the arc and the liquid pool of metal against all harmful gases. The best results have been obtained by the use of the socalled heavily covered electrodes. The author gives a practical and intimate turn to his discussion of pressure vessel application by telling of the experiences and practice of his own organization, a pioneer in this branch of the art. DTR (15)

The Development of the World's Lead and Zinc Production from 1907-1928. (Die Entwicklung der Blei- und Zinkerzeugung der Welt von 1907-1928.) F. SCHULTZ. *Internationale Bergwirtschaft und Bergtechnik,* Vol. 24, Mar. 30, 1931, pages 79-87; Apr. 15, 1931, pages 93-96; Apr. 30, 1931, pages 113-115; May 15, 1931, pages 124-128; May 30, 1931, pages 134-137.

This historical review bears the sub-title: "An investigation of the technical and economical evolution of Pb and Zn mining, with special reference to the influence of improvements regarding mining, ore dressing and smelting methods." The different continents are discussed separately. A summary in German, English and French is included. EF (15)

Old Brass Plants in the Upper Drau Valley. (Die bestandenen Messingwerke des oberen Drautales.) R. CANAVAL. *Montanistische Rundschau,* Vol. 34, Aug. 1, 1932, pages 1-9.

Interesting outline of the history of the century old existence of brass producing plants in the Drau valley, Austria. 16 references. GN (15)

Technical Education and Training. JOHN ORR. *Transactions South African Institute of Electrical Engineering,* Vol. 23, Apr. 1932, pages 77-145.

An historical review of the work during the past 23 years of the technical schools of South Africa. WHB (15)

The Development of the Electro-Pig Iron, Steel, and Cast Steel Production. (Die bisherige Entwicklung der Elektro-Roheisen-, Stahl- und Stahlgusserzeugung.) E. KOTHNY. *Elektrowärme,* Vol. 2, July 1932, pages 160-163.

A complete review shows the development since its inception of the production of Fe and steel in electric furnaces in the different countries, their share in the world production, where and when it was first introduced, type of furnace and kind of product. The statistics cover the time from 1906 to 1930 and give also some indication what price can be paid for electric energy in order to make the electric process competitive with other fuels. Particular application has been made of the electric furnace in the field of special steels and small steel castings. Ha (15)

Aluminum and Its Metallurgical and Commercial Prospects. ROBERT P. TOD. *Metal Industry,* London, Vol. 40, Jan. 15, 1932 pages 63-68.

The history of the development of Al is discussed. PRK (15)

Properties of Some Si-Mn Steels. (Eigenschaften einiger Silizium-Manganstähle.) *Die Metallbörse,* Vol. 22, May 14, 1932, page 611.

A literature review of properties of Si-Mn structural steels with emphasis on recent statements of Burns. EF (15)

Note on the Early History of Rust Protection. (Aus der Kindheit des Rostschutzes.) O. VOGEL. *Korrosion und Metallschutz,* Vol. 8, Apr. 1932, pages 91-92.

Gives some early references (1786) on the corrosion resistant Fe of Bernard & de Canclers, Paris. EF (15)

Old and New Welded Ornamental Work. (Alte und Neue geschweisste Kunstschmiedearbeiten). HERMANN RICHTER. *Autogene Metallbearbeitung,* Vol. 25, May 1, 1932, pages 129-134.

An historical review of the development of ornamental arts in iron which spread from the Roman empire and Greece to other countries. A number of typical examples of the art and their working methods are described. Ha (15)

ECONOMIC (16)

Molybdenum Industry in 1931—Advance Summary. P. M. Tyler & H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 102, Apr. 7, 1932, 2 pages.

Domestic mine production in 1931 was approximately 3000 short tons of Mo concentrates containing 5,221,000 lb. (average 85.93%) MoS_2. Shipments of an equivalent of 3,157,000 lb. Mo were valued at $1,577,000. In 1930 production was 3618 short tons of concentrate containing 6,205,000 lb. (average 85.75%) MoS_2. Shipments in 1930 were equivalent to 3,759,269 lb. Mo, worth $2,068,000. The principal depelopment of the yr. was the rapid increase in the use of Mo in cast Fe. Uses are discussed. 3 companies, 2 in the U. S., produce 97-98% of the world's Mo. AHE (16)

The European and World Zinc Situation. O. W. Roskill. *Advance Paper, American Zinc Institute,* Apr. 1932, 11 pages.

The trend of production during the last decade, the causes of increased production, due to improved processes and greater prospecting activity, the trend of consumption, prices and production cost, plans for regulating production and consumption, tariff bills in different countries, and the galvanizing industries are reviewed. The need for intensive research to meet the growing competition of various non-ferrous metals and alloys for the same purpose as Zn is emphasized, particularly outside America. Ha (16)

The Costs of Converting Scrap of Aluminum, Brass, Red Brass and Bronze into New Ingot Metal. (Die Kosten einer Umarbeitung von Aluminium-, Messing-, Rotguss-und Bronzeabfällen zu neuwertigem Blockmetall.) H. Reininger. *Die Giesserei,* Vol. 19, Jan. 22, 1932, pages 28-29.

It is pointed out that in all plants where continually large amounts of scrap materials are produced it is more profitable to convert them into new ingot material than to sell them as scrap. Comparative data are tabulated. Ha (16)

Four Man-Hours of Direct Labor in Ton of Open-Hearth Steel. *Steel,* Vol. 90, Jan. 4, 1932, page 138.

It requires 4.14 man-hrs. of direct labor to produce one gross ton of open-hearth steel using 55% scrap. It requires 5.88 man-hrs. to produce one ton of pig iron and 7.38 man-hrs. to produce one ton of steel if no scrap is used. JN (16)

One Has to Discount the Lessons of Tikhvinaluminostroy. Tourkin. *Light Alloys,* Feb. 1932, pages 7-9. (In Russian.)

The activities of this organization controlling and operating bauxite mines supplying the country with alumina were a failure on account of the disorganization and stealing. The production reported as 115% actually was only 20%. (16)

At Leningrad Aluminostroy. A. P. Serebrowsky. *Light Metals,* Feb. 1932, pages 5-7. (In Russian.)

Utter disorganization at Volkhov aluminum plant badly interferes with its completion. (16)

The Austrian Iron, Metal and Machinery Industry in 1931. (Die österreichische Eisen-, Metall- und Maschinenindustrie im Jahre 1931.) *Tägliche Montanberichte,* Supplement to *Montanistische Rundschau,* Vol. 24, Mar. 16, 1932, pages 1-5.

Annual Report on the Austrian steel business in 1931. GN (16)

Mercury Exports in 1931—Advance Summary. *United States Bureau of Mines Mineral Market Reports* No. M.M.S. 108, Apr. 26, 1932, 2 pages.

In 1931 the U. S. exported 4984 flasks of Hg valued at $433,596. Figures are given by countries. AHE (16)

United States' Lead in World Production Cut. *Steel,* Vol. 90, Jan. 4, 1932, pages 148-149.

The World's production of iron and steel continued to decline during 1931, falling to 68,662,000 gross tons of steel ingots and castings as compared to 92,877,000 tons in 1930 and 117,980,000 tons in 1929, and dropping to 55,312,000 gross tons of pig iron as compared to 78,485,000 tons in 1930 and 96,729,000 tons in 1929. Although maintaining its leadership, the U. S. produced only 37% of the world's output of steel in 1931 as against 43% in 1930 and only 33% of all pig iron as against 40% in 1930. The per capita consumption of steel in the U. S. dropped to 4.61 lbs. in 1931. JN (16)

Steelmaking Capacity Added in 1931 Unparalleled in Past 13 Years. *Steel,* Vol. 90, Jan. 4, 1932, pages 171-173.

A discussion of the steel making equipment completed or in process of construction in the United States during 1931. This includes the following installations.

	Completed in 1931	Incomplete Dec. 31, 1931
By-Product coke ovens	68	138
Stacks remodeled	6	3
Open-hearth furnaces	34	0
Rolling Mills	33	21

10 blast furnaces were dismantled in 1931. JN (16)

Foundries Study Markets in Low Production Period. *Steel.* Vol. 90, Jan. 4, 1932, pages 166-167.

In spite of poor demand and low prices, the steel foundry industry was busily engaged during 1931 in developing new lines, exploring new markets, studying new uses for castings, and otherwise preparing for new business when economic conditions should improve. Production costs were lowered by the introduction of short cuts in manufacture, improvements in heat treating and manufacturing methods, the reduction of waste, and the wider use of scientific metallurgical control of foundry operations. The gray iron and malleable iron industries also weathered the depression, improving their manufacturing methods, contributing their respective research institutes, and adding to the number of electric melting furnaces. JN (16)

More Iron and Steel Than Iron Ore. *Steel.* Vol. 90, Jan. 4, 1932, pages 143-145.

During 1931, the production of iron and steel exceeded the total production of iron ore. During the past 20 years steel production increased 36%, pig-iron and ferro-alloys increased 10%, while iron ore production decreased 3%. The increased use of scrap and improvements in furnace practice have conserved over 14 million tons of ore during the past 5 years. However, it is believed that the proportion of scrap has reached its maximum and that future steel demands will call for greater ore production. JN (16)

Estimation of Small Castings. (Kalkulation von kleinen Gussstücken.) Werner Weck. *Die Giesserei,* Vol. 19, Mar. 4, 1932, pages 91-92.

A few examples are given to show that small castings are often offered for too low a price; the actual amount of molten Fe used should be figured and the correct piece price and overhead included to arrive at the exact cost. Ha (16)

Production Economy in Iron and Steel Works. Part II. Cost of Production. O. Cromberg. *Engineering,* Vol. 132, Oct. 16, 1931, pages 484-485.

See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 76. LFM (16)

New Methods of Calculating the Cost of Production in Steel Foundries. (Neue Formen der Selbstenrechnung in Stahlgiessereien.) O. Cromberg. *Archiv für Eisenhüttenwesen,* Vol. 5, July 1931, pages 63-70.

The author describes a new system of calculating the production cost in steel foundries and shows that by determining the characteristic, "Kennzahlen," of the plant its economy can be simply supervised, and the price of the product is easy to find. The usual practice in cost finding in foundries has been to take the productive wages as the basis of calculation. This method is refuted and it is recommended that "wage-time" should be taken as basis. The new calculating method is illustrated by examples and figures. GN (16)

Building Retains Lead in Steel Consumption. Automotive Industry Passes Railroads as Second Largest Consumer. *Steel,* Vol. 90, Jan. 4, 1932, pages 131-133.

The annual survey of finished rolled steel distribution shows a greatly decreased consumption for 1931. This is estimated at 17,956,582 gross tons as against 28,686,600 gross tons for 1930. The consumption of steel in 1931 was distributed as follows: Building industry, 16.80%; automotive industry, 14.78%; railroads, 14.65%; oil, gas and water, 9.75%; highway construction, 2.35%; food packing industries, 7.90%; mining and lumbering, 0.83%; shipbuilding 1.03% and machinery, tools and equipment, 3.37%. JN (16)

Steel Fights to Loosen Grip of Depression. *Steel,* Vol. 90, Jan. 4, 1932, pages 150-151, 153.

The low prices and low consumption of steel in 1931 are seen as resulting from decreases in building construction, automobile output, freight traffic and the manufacture of steel products and fabricated steelwork. The steel industry is seeking to meet this condition by reductions in wages and economies in operation, management, etc. JN (16)

Gold, Silver, Copper, Lead and Zinc in Nevada in 1930. V. C. Heikes. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, Part I, May 20, 1932, pages 515-554.

The total value of the mine production of Au, Ag, Cu, Pb and Zn from Nevada mines in 1930 was $21,455,517, a decrease of $11,574,720 from 1929. Au output decreased from 163,711.22 to 149,064.47 oz., Ag from 4,923,526 to 4,219,832 oz., and Cu from 140,138,809 to 109,203,512 lbs. (22% decrease in amount and 42% in value). Pb production increased from 19,692,568 to 23,058,311 lbs. and Zn from 16,920,083 to 29,168,-117 lbs., exceeded only by 1916. AHE (16)

Magnesium Industry in 1931—Advance Summary. A. E. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 107, Apr. 14, 1932, 2 pages.

In 1931, 580,463 lbs. of Mg ingot worth $199,633 were sold or used, an increase of 3.7% in quantity and a decrease of 26% in value from 1930. Domestic Mg was all obtained from $MgCl_2$ at Midland, Mich. Sales of Mg alloys, castings, powder, wire and ribbon, rod and tubing, sheet, etc. are detailed for 1929, 1930 and 1931. AHE (16)

Iron and Steel Industry in 1931—Advance Summary. H. W. Davis. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 113, May 26, 1932, 5 pages.

The production of steel decreased from 40,699,483 gross tons in 1930 to about 25,600,000 tons in 1931. Pig Fe production (exclusive of ferro-alloys) declined 42% from 1930 to an output of 17,952,613 gross tons in which was used 29,286,653 gross tons of domestic Fe ore and manganiferous Fe ore, 1,231,587 tons of foreign Fe ore and manganiferous Fe ore, and 3,127,099 tons of cinder, scale and scrap, an average of 1.874 tons of metalliferous materials per ton of pig Fe (1.939 in 1930). Production of ferro-alloys (466,969 tons) declined 36% from 1930. 1931 production of ferro-Mn was 166,937 gross tons containing about 131,200 tons of Mn (78.59%), in which was used 287,973 gross tons of foreign Mn ore, 10,945 tons of foreign ferruginous ore, 12,277 tons of domestic Mn ore, 8,269 tons of Fe ore and 3,405 tons of cinder, scale and scrap, a total of 1.799 tons of ore per ton of ferro-Mn (1.792 in 1930). Production of ferro W was 847 tons (79.15% Fe) and of ferro V was 373 tons (37.19% V). Fe ore mined was 31,131,502 gross tons, a decrease of 47% from 1930. AHE (16)

Secondary Metals in 1930. J. P. Dunlop. *Mineral Resources of the United States, United States Bureau of Mines,* 1930, Part I, Dec. 31, 1931, pages 333-354.

The total decrease in quantity of the secondary metals covered in this inquiry was 24% in 1930, compared with an increase of 7% in 1929. Production for 1929 and 1930, respectively, were Cu 417,600, 332,800; brass 298,500, 192,000; Pb metal 138,500, 129,000; Pb in alloys 172,500, 126,800; Zn metal 65,400, 49,300; Zn in alloys other than brass 11,600, 7,700; Sn metal 7,400, 5,600; Sn in alloys and chemical compounds 26,900, 20,600; Sb 11,131, 8,082; Al metal 25,850, 19,700; Al in alloys 22,550, 18,900; Ni metal 850, 500, and Ni in alloys and salts 3,500, 2,400 short tons, 913,382 tons worth $193,255,100 as compared with 1,202,281 tons worth $331,028,-900. In 1930, 47,316 oz. of Pt, 34% of imports, was recovered, 4,557 oz. more than in 1929. Mints and refineries recovered 6,472,713 oz. of Ag and $22,189,966 in Au from waste. AHE (16)

Lead and Zinc Pigments and Zinc Salts Industry in 1931—Advance Summary. H. M. Meyer. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 120, June 8, 1932, 2 pages.

Decreases in Pb pigment sales in 1931 were as follows: red Pb, 22%; orange, 21%; basic Pb sulphate, 16%; litharge, 12%; and white Pb, dry and in oil, 5% each. ZnO sales declined 20%, lithopone 7% and $ZnSO_4$ 15%. Sales of leaded ZnO were 8% higher than in 1930 and of $ZnCl_2$ 20% higher. Figures are given for consumption by uses. AHE (16)

MISCELLANEOUS (20)

Experiments on Impact. J. P. Andrews. *Proceeding Physical Society*, London, Vol. 43, Pt. 1, Jan. 1, 1931, pages 8-17.

This paper, which describes the continuation of a research on the impact of soft metallic bodies, contains the results of 4 investigations, as follows: (1) Impact of equal spheres for low values of the velocity of approach v. The duration of contact is found to vary inversely as $v^{1/5}$, whilst the coefficients of restitution e in the same cases are found to be unity for all speeds below a value characteristic of each material, as though the metals were perfectly elastic for smaller speeds. (2) The effect of duration of contact on the size of the permanent deformations. No effect was observed. (3) the variation of duration of contact t with mass of sphere at high speeds of approach. Within the limits of experimental error, t varies as the square root of the mass, as theory predicts. (4) The impact of crossed cylinders. No important new phenomena are found. Ha (20)

The Physics of High Pressures. P. W. Bridgman. G. Bell & Sons, Ltd., London, 1931. Cloth, 5¾ x 9 inches, 390 pages. Price 22s.6d.

When a man has worked 25 years in a well defined field and published some 73 papers on that field, it is time to write a book about it. The need of a good book on high pressure phenomena and Professor Bridgman's qualifications for writing it are well known. The word "Physics" in the title is to be interpreted in its broadest sense, for the book covers many types of changes which may be produced by using pressure as an independent variable. We find, for example, chapters not only on the P-V-T relations in fluids and the compressibility of solids, but also on melting phenomena, polymorphic transitions, electrical resistance, thermoelectric properties, thermal conductivity and viscosity. The treatment of these subjects is mostly a description of the experimental method used and the results obtained. Mathematical theory is largely absent except for simple thermodynamics which is unusually powerful in this field. Extremely valuable are the chapters on the general technique of the production and measurement of high pressures. The author ascribes his success to his method of leakless packing of pipe connections and pistons.

(page 35) "The principle of unsupported area . . . (of packing) . . . is the only thing that has made possible my own high pressure work."

(page 78) "The whole high pressure field opened almost at once before me, like a vision of a promised land with the discovery of the unsupported area principle of packing, by which the only limit to the pressures attainable was set by the metal parts of the apparatus."

For high pressure pump cylinders he uses an electric furnace chromium-vanadium steel of typical analysis—Cr 0.93, Mn 0.68, C 0.51, Si 0.23, Va 0.18, S 0.010, P 0.008. This is hardened and drawn to a Brinell hardness of 400. Plungers are of glass hard ball bearing steel, which by careful axial loading have withstood 750,000 lbs./in.^{2} in compression. It is shown that under the conditions imposed by hydraulic pressure in a hollow cylinder neither the tensile strength or elongation are criterions of rupture, for such material will withstand stresses and elongations several times those of the tensile test. Furthermore, rupture begins from the outside where stress and elongation are a minimum. Except under special conditions glycerine and water or kerosine are used to transmit the pressure. Pressures of over 40,000 kg./in.^{2} are mentioned, though for most of the data 12,000 kg. is the maximum. The working standard of pressure measurement is the change in resistance of a manganin coil. The photograph (facing page 44) of a typical pressure installation will delight those who believe that the proper place for fine workmanship is in the working parts of an apparatus, and that electric wiring can be done without the aid of a licensed electrician and metal conduit. Though dealing largely with the work of the author, adequate mention of previous investigators is given. The index is poor, giving mostly authors' names. H. W. Russell (20)-B-

Straightening Damaged Parts of Steel Cars. *Transit Journal*, Vol. 76, Apr. 1932, pages 179-181.

Methods used, some of an ingenious nature, in repairing collision damages. CBJ (20)

Analysis of Accident Causes in the Metals Industry. C. P. Waite. *Heat Treating & Forging*, Vol. 18, Feb. 1932, pages 104-106.

Paper read before the Annual Safety Congress, Oct. 31, 1931. Cites examples of accidents in metal-working plants to show how true causes may be determined by ascertaining the manner in which the workman was doing his work at the time of the accident, and why he was doing it that way. MS (20)

The Principles of Electrical Gas Purification. (Die Grundlagen der elektrischen Gasreinigung.) R. Strigel. *Die Naturwissenschaften*, Vol. 19, July 17, 1931, pages 626-634.

The principles underlying the electrical dust and fume precipitation according to Cottrel-Möller is fully discussed with respect to (1) the corona discharge phenomenon, (2) the charge of the suspended particles, (a) theoretical considerations, (b) experimental results, (3) the effect of the electrical wind, (4) the mechanism of the precipitation. 44 references. EF (20)

Structure, Strength, Stability. (Struktur, Festigkeit, Stetigkeit.) W. Kuntze. *Mitteilungen der deutschen Materialprüfungsanstalten*, 1932, No. 12, page 180.

Abstract. For abstract of original article see *Metals & Alloys*, Vol. 2, Oct. 1931, page 227. HWG (20)

Polarised Light and Its Applications to Engineering. *Metallurgia*, Vol. 5, Apr. 1932, pages 189-194.

An extended abstract of the lecture delivered before the Institution of Mechanical Engineers by Prof. E. G. Coker. Several full-colored illustrations are included. JLG (20)

LABORATORY APPARATUS (21)

New Equipment for Metallographic and Mechanical Laboratories. K. F. Starodoubof. *Domez* (Achievements of Metallurgy in USSR and Abroad), No. 10, 1931, pages 47-60.

A review of foreign instrument exhibition in Leningrad in 1931. The exhibits were furnished principally by German firms though a few U. S. manufacturers of metallographic and testing equipment were represented. (21)

A High-Temperature Electric Furnace and a Micro Adaptation. R. C. Emmons. *Science*, Vol. 73, May 8, 1931, pages 499-500.

A very cheap and practical home-made furnace with nichrome-wire heating elements for temperatures up to 1000° C. is described; also a resistance furnace made of arc-lamp C for temperatures up to 2300°. The latter may be modified by drilling a hole in the side of the rod to hold the sample and placing on a transite board on a microscope stage to observe the fusion. Ha (21)

Two Novel Methods for the Unequivocal Indexing of Convergency Photograms. (Zwei neue Methoden zur eindeutingen Indizierung von Konvergenzaufnahmen.) O. Kratky (Kaiser Wilhelm Institut für Faserstoffchemie, Berlin-Dahlem). *Zeitschrift für Kristallographie*, Vol. 76, Feb. 1931, pages 517-524.

Two methods are developed for the unequivocal indexing of X-ray photograms in which crystal and film are stationary. Manifold directions of the incidenting X-ray beam are secured by the utilization of a "flat convergency beam." A less accurate mounting of the crystal does not exert a material influence on the subsequent indexing. The first method outlined in the paper is simpler in regard to the experimental accomplishment than the second one. The graphical evaluation, for which a special apparatus was designed, takes more time for the second method. EF (21)

Rhodium Wire for Laboratory Furnaces. (Rhodiumdraht für Laboratoriumsöfen.) Ilja Westermann. *Metallwirtschaft*, Vol. 11, Mar. 11, 1932, pages 152-153.

Furnaces with Pt wire as a heating medium cannot be used above 1550° C. Ir is too brittle to be used in wire form. With Ir tubes 1700° C. can be reached, but in the presence of O the expensive Ir is quickly used up. For oxidizing atmosphere Rh wire forms a very good heating medium and can be used with safety up to 1700° C. The Rh wire is very carefully wound on a round piece of wood covered with paraffin. A piece of Pt wire is welded to each end to form the electrical connections. After building up the insulating material around the winding, inside of a fireclay tube, the whole mass is heated to dry the insulating material. The paraffin melts and the piece of wood is drawn out. CEM (21)

New Radiation Elements with Increased Sensitivity and Stability. [Neue Strahlungsmessgeräte (Thermoelemente) von gesteigerter Empfindlichkeit und Einstellgeschwindigkeit.] C. Müller. (Phys. Techn. Reichsanstalt) *Die Naturwissenschaften*, Vol. 19, May 15, 1931, pages 416-419.

Radiation thermo-elements are described of maximum 2/10,000 mm. fineness. The new method of preparing these highly sensitive thermo-couples replaces the widely used soldering and welding and prepares a thermo-electrically active alloy by a diffusion process. For instance, a Ni wire is coated with 2 metals, e.g. Cr and Cu, over different parts of its length by electrodeposition. Annealing results in a diffusion thus yielding a Constantan and Cr-Ni alloy of great thermal power. The former thermo-couples of Moll, distinguished by their low heat capacity and short times of coming to rest are considerably surpassed as shown by several experiments. The new thermo-couples are marketed by the Schwarzlose Laboratorium, Berlin. EF (21)

Utilization of Rhodium Implements for the Investigation of Oxide Systems. (Die Verwendung von Rhodiumgeräten zur Untersuchung von Oxydsystemen.) G. Trömel & F. Weber. *Die Naturwissenschaften*, Vol. 19, June 5, 1931, pages 519-520.

The utilization of the usual crucible material for melting oxides is critically discussed. The use of Pt and Ir is prohibitive above 1600° C. and in vacuo respectively. For an investigation of the ternary $CaO - P_2O_5 - SiO_2$ system, Rh crucibles of W. C. Heraeus-Hanau were successfully employed in a high frequency furnace. The temperature measurement was performed by an Ir/Rh — Ir/Ru thermo-couple. In another furnace, the Pt-resistance winding was replaced by Rh and the Marquardt Mass was replaced by Zr-oxide. EF (21)

A New Apparatus for Determination of Melting Points. Mototaro Matsui & Hirondo Kato. *Journal Society of Chemical Industry*, Japan, Vol. 35, Apr. 1932, pages 169B-171B.

Describes and illustrates the new apparatus for determining the melting points of metals, and the method for using it, as well as its advantages and superiority to that of the Denis instrument. MAB (21)

Workshop Spectroscope for Steel Examination. *Engineering*, Vol. 132, Dec. 11, 1932, pages 746-748.

Illustrates and describes Spekker Steeloscope made by Adam Hilger, Ltd., London. The instrument consists of a tripod on which is mounted a box containing the prisms. Two tubes are attached to this box, one carrying the slit and the other the eyepiece. On the eyepiece end are engraved a number of lines, each marked with the chemical symbol of one of the alloying elements. An arrow is engraved on the sliding plate carrying the eyepiece and by moving the latter so that the arrow coincides with one of the fixed marks, the part of the spectrum containing the most distinctive lines of the element to which the mark relates will be brought into the field. The elements provided for include: Cr, V, Sn, Mn, Co, Ti, Ni, Cd, Cu, W and Mo. The instrument can be secured in a modified form for examining non-ferrous metals and alloys. LFM (21)

Testing Machines. H. O. Hem. *Scale Journal*, Vol. 18, Apr. 1932, pages 6-8.

A few universal testing machines for physical properties are described quite generally. Ha (21)

FOUNDRY PRACTICE & APPLIANCES (22)

Remarks on the Paper "Practical Silver Art Casting." (Zu dem Artikel "Praktischer Silberkunstguss.") F. Göcking. *Deutsche Goldschmiedezeitung,* Vol. 35, July 30, 1932, pages 311-312.

The author rejects some of the statements made in a paper in *Deutsche Goldschmiedezeitung,* Vol. 35, July 2, 1932, pages 276-277. GN (22)

Bronze in the Foundry. Wesley Lambert. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 85-87.

Good practice for melting bronze is described together with the preparation of the molds. A table lists the composition of many bronzes and the uses to which they are put. PRK (22)

Controversies Between Machine Designer and Foundry. (Reibungsflächen zwischen Maschinenbau und Giesserei.) C. Müller. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 12, 1932, pages 233-235.

The paper discusses the points which frequently cause controversies between foundry and designer: proper dimensions, porosity, ununiform hardness of the castings, defects of minor importance. GN (22)

Mold Handling Methods in Foundries. Wm. L. Hartley. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Materials Handling, pages 59-63.

The mold-handling problem and present day practice in application of mold-handling devices in intermittent and semi-continuous foundries is discussed. A few installations are described. Ha (22)

Making the Mold of a Spiral 4000 mm. in Length and 300 mm. in Diameter. (Die Herstellung der form zu einer Schnecke von 4000 mm. Länge und 300 mm. Durchmesser.) Arno. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 15, 1932, pages 208-210.

Detailed description of the molding practice. GN (22)

Contraction Allowance Varies with Conditions. R. A. Bull. *Foundry,* Vol. 59, Dec. 1931, pages 35-36.

Slightly abridged from *Research Group News.* Factor of shrinkage incident to change of steel from molten condition at high temperature to solid form at atmospheric temperature is important in respect to strains set up in steel at various stages. Contraction figures vary not only because pouring temperatures vary, but contraction allowances must be regulated in accordance with design. VSP (22)

The Layout of the Foundry. (Die Anlage der Giesserei.) G. Krebs. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 29, 1932, pages 220-221; June 12, 1932, pages 235-236.

Discussion of the points to be borne in mind in the layout of foundries. GN (22)

Testing and Rating of Core-Sands and Core-Binders. (Ueber die Prüfung und Bewertung von Kernsanden und Kernbindemitteln.) Th. Klingenstein. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, Dec. 1931, pages 175-185.

The possibilities of commercial core-binders and their rating and prices are discussed and testing methods and numerical values of properties of sand, oils and finished cores given. A bending number is derived which makes possible a rating of the binder. 30 references. Ha (22)

The Bessemerization of Bell Bronze. John B. Kasey. *Metal Industry,* N. Y., Vol. 30, May 1932, pages 185-186.

Results are given in tabular form of experiments carried out in Moscow, U. S. S. R., in a study of the recovery of Sn from bell bronze. PRK (22)

Arrangement of Pattern and Mold for a Part of a Large Gas Engine. (Modell- und Formaufbau für ein Grossgasmaschinen-Mittelstück.) H. Erkart. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 29, 1932, pages 228-231.

A detailed description is given of pattern design, pattern making and molding practice of the complicated part of a large gas engine. GN (22)

Melting and Casting of Aluminum Alloys. (Zum Schmelzen und Giessen von Aluminiumlegierungen.) W. Fröhlich. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 15; 1932, pages 206-207; May 29, 1932, pages 224-225.

The paper gives no general description of the common melting and casting practice of Al alloys but considers the most important and most frequent mistakes made in processing such alloys. The first installment deals with the application of preliminary alloys in melting Al-alloys and the application of fluxes and purifiers. A simple effective purifier is a mixture of 85% NaCl and 15% CaF_2 or cryolite. A better purifier is the following mixture: 2 parts of cryolite, 2 parts of K_2CO_3, 1 part of borax, 10 parts of Na_2CO_3. About 1.5 kg. of this mixture used per 100 kg. of the melt. The 2nd installment gives practical hints as to the casting practice. To accelerate the melting process and for a better protection against oxidation the ladle should be completely emptied in casting. Failures due to improper casting temperatures and improper treatment of the crucibles are particularly dealt with. The paper concludes with considerations on molding practice and failures due to improper molding. GN (22)

Plasticity Investigations with synthetic Molding Sand Mixtures compared with the Results obtained with Natural Sands. (Bildsamkeitsuntersuchungen an synthetischen Formsandgemischen im Vergleich mit den an natürlichen Sanden erzielten Ergebnissen.) H. Nipper & E. Piwowarsky. *Mitteilungen aus dem Geisserei Institut der Technischen Hochschule Aachen,* Vol. 2, Oct. 1931, 7 pages.

The methods for testing the plasticity of a molding sand are reviewed and the roll test was selected for the tests made here to determine the plasticity and its connection with shape of grain, size of grain, content of clay and humidity. The results are given in tables to which the reader must refer. Ha (22)

Base Plate of a Turbo- Compressor made with Templet. (Mittels Ziehschablone hergestellte Grundplatte für Turbokompressor.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 10, 1932, pages 277-278.

Discussion of procedure to be followed. GN (22)

New Machine for Instantaneous Molding of Cores by Blowing. (Nouvelle Machine a Mouler instantanement les Noyaux par Soufflage.) E. Monnot. *Revue de Fonderie Moderne,* Vol. 26, May 25, 1932, pages 167-169.

A machine is described which forms small cores in quantity production by blowing the sand into the core-box under air pressure. Ha (22)

Molding and Pouring of a Locomotive Smoke Stack (Formen und Giessen eines Lokomotivschornsteins). *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, pages 270-271.

Illustrated description of molding and pouring practice. The coöperation between pattern-shop and foundry is emphasized. GN (22)

Making a Large Turbine Cylinder Casing Pattern. J. R. Moorehouse. *Foundry Trade Journal,* Vol. 46, May 5, 1932, pages 277-278.

Article shows the methods adopted in building up the shape of a 50,000-kw. (and over) turbine cylinder casing pattern, having a metal thickness of approximately only 1¼". OWE (22)

Contraction, Distortion and Camber in Grey Iron Castings. E. Longden. *Foundry Trade Journal,* Vol. 46, June 30, 1932, pages 395-398, 408; Vol. 47, July 7, 1932, pages 3-5, 12.

The author points out that there is a striking lack of data and of standards for camber allowances in castings. A chart showing the relationship between camber and the various dimensions of large machine-tool castings is shown. Such charts cannot be applied generally, since heavy castings do not contract in conformity with the ordinary standard allowances, the same amount of metal poured into a simple plate, a gear box, or a plain block casting disclosing altogether different behavior in the 3 castings. The importance of design in its bearing on the camber of castings is dealt with in brief and attention is directed to the influence upon camber of such factors as mold materials, metal temperature, methods of molding, etc. OWE (22)

Oil-Cores in the Manufacture of Steel Castings. (Oelkerne bei der Herstellung von Stahlguss.) H. Nipper & K. Krekeler. *Die Giesserei,* Vol. 19, June 24, 1932, pages 247-249.

On account of the high temperatures used in casting alloyed steels the employment of properly burnt oil-cores is important in order to obtain satisfactory castings. The method of making these cores is described in detail. Ha (22)

Some Considerations in Gating and Pouring Castings. (Eenige geschouwingen over het maken van gietloopen en het gieten van gietstukken.) E. V. Ronceray. *De Gieterij,* Vol. 6, June-July 1932, pages 62-65.

Paper read before American Foundrymen's Association. See *Metals & Alloys,* Vol. 2, Aug. 1931, page 150. MPW (22)

A Contribution to the Knowledge of the Heat Resistance of Molding Sands. (Beitrag zur Kenntnis der Feuerbeständigkeit von Formsanden.) H. Nipper & E. Piwowarsky. *Mitteilungen aus dem Giesserei-Institut der Technischen Hochschule Aachen,* Vol. 2, Oct. 1931, 6 pages.

3 kinds of heat resistivity are distinguished: (1) simple heat resistance or the strength on heating, (2) heat resistance at a simultaneous mechanical and temperature stresses, and (3) heat resistance at simultaneous mechanical, temperature and chemical stresses. Methods for the determination of the behavior of a sand according to these 3 kinds of stress are described; the tests made permitted some conclusions with regard to the lowering of the melting or sintering point with increasingly fine grain and decreasing velocity of heating. The behavior of sand cones in Fe of different temperature is recommended as very useful in judging the quality of a sand. Ha (22)

The Testing of Molding Sand with Respect to Its Structural Elements. (Ueber die Prüfung des Formsandes auf seine Strukturelemente.) H. Nipper & E. Piwowarsky. *Mitteilungen aus dem Giesserei-Institut der Technischen Hochschule Aachen,* Vol. 2, Oct. 1931, 6 pages.

The differences between molding sands can consist in the mineralogical composition of the grain, size of grain, shape and surface of the grain, contents of clay and its composition, by the distribution of the constituents and humidity. Testing methods are reviewed and tests made, the results of which are used to determine beforehand the properties of a molding sand from its structural elements. Ha (22)

Chilled Cast Iron and the Avoiding of Sharp Transitions in Gray Cast Iron. (Der Hartguss und die Ueberbrückung schroffer Uebergänge beim Grauguss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 7, 1932, pages 303-306.

The paper discusses the importance of proper dimensions of the Fe molds, choice of suitable casting temperatures and composition of the charge. As the average composition of good chill Fe the following is given: 3.5% C, 1% Si, .5% Mn with the lowest possible content of S and P. The molds for such Fe should be made of Fe with low contents of C, Si, Mn, P and S. If possible the molds should be annealed before use, to make them more resistant to the attack of the hot Fe. Facing of the molds with graphite is discussed. Examples for proper wall thicknesses of molds are given. Points to be borne in mind in using permanent molds are discussed. The use of chill molds is dealt with. GN (22)

Directions for the Preparation of Molding Sand and the Choice of Binders for Cores. (Richtlinien für Formsandaufbereitung und Wahl der Bindenmittel für Kerne.) Walter Obst. *Die Giesserei,* Vol. 19, June 24, 1932, pages 249-250.

The properties of sand and materials for cores are reviewed and the requirements for good castings discussed. The sand should be tested for content of fine sands; addition of quartz increases refractoriness. Molasses and resins with sulphite lyes are used as binders. Oil-cores are made of a mixture of 5 kg. linseed oil to 100 kg. sand, and in order to increase the porosity, rye flour and resin is added. Quite recently, caoutchouc is used as core binder which gives the core a higher strength even if it is not quite dry. The caoutchouc is dissolved in petroleum or naphtha; a 7% solution is usually employed, about 8 l. for 450 g. The heat of the casting destroys the core; the latter therefore last as long as required. Ha (22)

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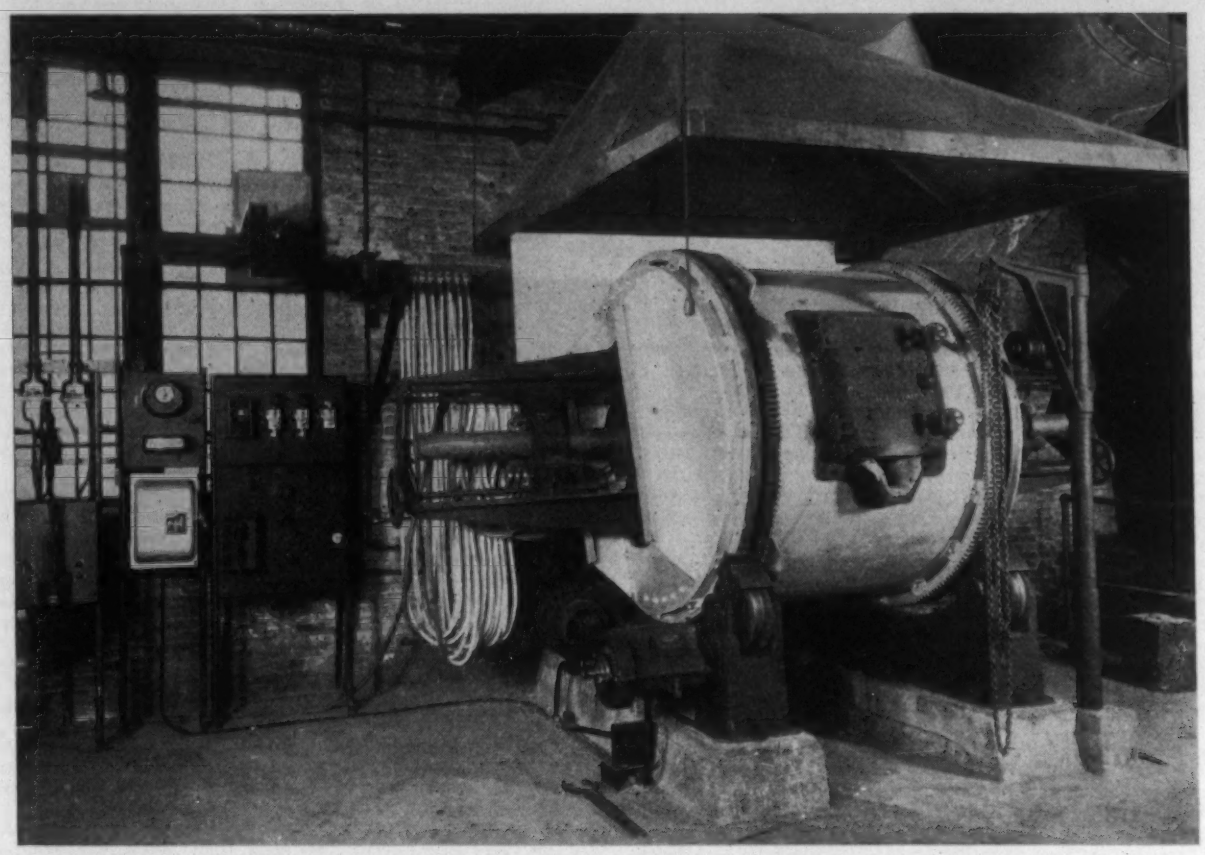

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offers unequalled facilities for the economical production of various types of castings with precision in chemical and physical characteristics. The accuracy of temperature control and complete homogeneity which are insured by the rocking action of the DETROIT Electric Furnace, together with its simplicity of operation, are determining factors in the highly satisfactory results being obtained by over sixty users in the ferrous field and over five hundred users in non-ferrous melting.

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FURNACES & FUELS (23)

A Thermal Study of an Open-hearth Furnace. WILLIAM M. HENRY & THOMAS J. MCLOUGHLIN. *Year Book of the American Iron & Steel Institute,* 1931, pages 123-170.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 281. (23)

Research in American Open-hearth Operation. (Neurungen im amerikanischen Siemens-Martin-Betrieb.) C. SCHWARZ. *Stahl und Eisen,* Vol. 52, Mar. 31, 1932, pages 311-313.

Summary of experimental work as brought out in *Iron Age* 128 (1931) pages 1434-1436, 1492-1493, 1624-1625 & 1630 and presented at semi-annual meeting of Steel Mill Committee. Detroit, November 24-25, 1931. 13 references. DTR (23)

Modern Furnaces for Annealing Cast Steel. (Moderne Ofen zum Glühen von Stahlguss.) H. KALPERS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Mar. 6, 1932, pages 94-98; Mar. 20, 1932, pages 113-115.

Furnaces for annealing cast steel are described. GN (23)

The Design of Normalizing Furnaces. E. E. GRIFFITHS. *Rolling Mill Journal,* Vol. 5, May 1931, pages 369-370, 379.

Paper presented before the British Institution of Mechanical Engineers. See "Factors Influencing the Design of Normalising Furnaces," *Metals & Alloys,* Vol. 2, Mar. 1931, page 75. JN (23)

Highest Temperatures in the Design of Resistance Furnaces. (Höchsttemperaturen im Widerstandsofenbau.) F. LAUSTER. *Elektrowärme,* Vol. 2, May 1, 1932, pages 103-106.

For temperatures above 1100° C. for which Cr-Ni resistances can not be used, Mo can be used with advantage, in spite of its high temperature coefficient. Arrangements must be made to protect the glowing resistance elements against oxidation; usually a gas-tight enclosure is provided, which sometimes is filled with a protective, such as a N-H mixture; the consumption is about 30 l./hr. Several constructions are described; one furnace for 1400° C. uses 26 kw. Because of the comparatively high temperature coefficient specia' care must be taken in starting the furnace in order not to overload the resistances. Ha (23)

Electric Continuous Furnaces for the Annealing of Metal Strips. (Elektrodurchziehofen zum Glühen von Metallbändern.) O. JUNKER. *Elektrowärme,* Vol. 2, Jan. 1932, pages 10-15.

See "Continuous Electric Furnace for Annealing Metallic Strips," *Metals & Alloys,* Vol. 2, Dec. 1931, page 308. Ha (23)

Experimental Investigations of a Theisen Cleaner for the Secondary Cleaning of Blast Furnace Gases. (Recherches experimentales sur un Desintegrateur Theisen pour l'Epuration secondaire des Gaz de Hauts Fourneaux.) M. STEFFES. *Revue Technique Luxembourgeoise,* Vol. 24, Jan.-Feb. 1932, pages 12-17.

Tests of a Theisen cleaner were run without gas, without water and with gas and water. The results are given in detail in diagrams and tables and the most economic conditions of operation with regard to output, pressure and degree of cleaning determined. Ha (23)

The Use of Pulverised Fuel and Pulverisers in the Foundry. P. HOWDEN. *Foundry Trade Journal,* Vol. 46, Mar. 10, 1932, pages 157-161.

Paper read before the Sheffield Branch of the Institute of British Foundrymen which discusses the type of coal suitable for pulverized-fuel firing, pulverizers, combustion and burning equipment. The use of powdered fuel in the melting of iron is considered, especially the Brackelsberg, Sklenar and Sesci furnaces. The advantages of using pulverized fuel are described. OWE (23)

Foundry Installs Large Oven. *Foundry,* Vol. 59, May 15, 1931, pages 95-96.

A core-oven, approximately 235 ft. long, of the roller conveyor type, claimed to be the largest in the world is described. The operating temperature is about 500° F. It was designed and built by the Foundry Equipment Co., Cleveland, for the General Steel Casting Corporation. VSP (23)

Small Continuous Conveyor Ovens Pay in the Smaller Plant. *Iron Age,* Vol. 128, Nov. 5, 1931, pages 1166-1169.

A continuous unit has certain well defined economic advantages over the intermittent oven. 3 installations of continuous small sized ovens are described one an "A" type oven, one a vertical and the third, an inclined oven. VSP (23)

The Improvement of Upper-Silesian Blast Furnace Coke and the Oxidation of Upper-Silesian Coals. (Ueber die Verbesserung von oberschlesischen Hochofenkoks und die Oxydation von oberschlesischen Kohlen.) W. KOPPERS. Doctor's thesis, Technische Hochschule Aachen, 1931. Paper, 6 x 9½ inches, 33 pages.

Upper Silesian coking coals alone give fingery, friable coke which breaks down to sizes undesirable for blast furnace use. Additions of semi-coke from non-coking Upper-Silesian coal, oxidized coking coal or semi-coke from oxidized coking coal give stronger, more blocky and improved coke. Fine grinding gives better quality coke having smaller cells and stronger cell walls. Narrow ovens and high temperatures are necessary for good coke. Microscopic studies of the cokes show no graphitization, but unusual amounts of precipitated graphite or retort C are found in the cell spaces and coke fissures. The importance of rate of heating during coking, of damage due to slow heating of high volatile coking coal and of long standing of finished coke is indicated. The addition of the above-mentioned inert materials reduces heat requirements and gives shorter coking time. Fresh and oxidized coking coals, non-coking coals and semi-cokes were extracted by benzine with pressure and the bitumins studied. Results are tabulated. Micro and macrophotographs of coke sections are given. FBH (23)

Coke in Electrometallurgy (Le coke en electrometallurgie). *Journal du Four Electrique,* Vol. 41, Feb. 1932, pages 60-62.

Electrochemical industries using a coke are giving to the chemical composition and physical properties of coke the same attention as to those of other raw materials. JDG (23)

Town Gas Fired Strip Annealing Furnace. *Iron & Coal Trades Review,* Vol. 124, Feb. 26, 1932, pages 356-357.

The construction of the furnace and its regulation of temperature is described; the consumption of 500 B.t.u. gas for heating is 1.3 ft.³/lb. of gross charge. The efficiency of the furnace is 33.8%. Ha (23)

Repairs to Steel Furnaces. WALTER LISTER. *Metallurgia,* Vol. 6, June 1932, pages 61-62, 65.

Gives detailed directions for repairing regenerators, overhauling the furnace and replacing the regenerators. JLG (23)

Surplus Heat Recovery from the Open-Hearth. W. GREGSON. *Iron & Coal Trades Review,* Vol. 124, June 10, 1932, pages 954-956.

From any open-hearth furnace operating on fuel gas, or a combination of gases giving a similar mean analysis of fuel, waste-heat can be recovered by steam raising in properly designed boiler plants with a very definite lowering of the cost of production of the prime product. A few typical constructions of waste-heat boilers and installations are described and tables and curves given showing combustion analyses and heat content of gases and combustion products. Ha (23)

Leakage, Insulation and Setting up of Open Hearth Regenerators. (Ueber Undichtheiten, Wärmeschutz und Beaufschlagung von Siemens-Martin-Kammern.) FRANZ KOFLER. *Archiv für das Eisenhüttenwesen,* Vol. 5, Apr. 1932, pages 493-502.

Report 224 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. Practical tests were carried out on experimental chambers in Ruhrort-Meiderich Plants. Leakage in brickwork was given by a permeability number, and curves illustrating this number were drawn for 5 types of brickwork construction. An example giving gas leakage before and after tightening up brickwork shows a gas saving of 4% or 0.20 R.M./ton steel. The effect of leakage air on temperature and of O_2-content on temperature decrease of gases in the air chamber of an open-hearth furnace is shown graphically. In setting up an open-hearth regenerator it is necessary for obtaining uniform heat exchange that the velocity of the gases during heating and cooling periods be as high and uniform as possible in a cross section normal to direction of gas flow. DTR (23)

The Valve System of Regenerative Furnaces and a New Valve Construction. (Synpunkter pa regenerativt eldade ugnars vetilsystem samt en ny ventilkonstruktion.) SIXTEN WOHLFAHRT. *Jernkontorets Annaler,* Vol. 116, Mar. 1932, pages 107-119.

A new valve is described, which, for 4 regenerators consists of 4 slide valves and 4 disc valves, 1 valve of each kind being operated with 1 and the same wire. The slide valve being heavier than the disc valve, the former cannot open until the latter is closed. With the disc valve closed, the slide valve may be fixed in any desired position. The valve system has been tried in practice with the result that the production was increased from 12,000 to 14,000 tons, while the fuel consumption was decreased 14%. HCD (23)

Soaking Pits without Checkers. J. B. NEALEY. *Blast Furnace & Steel Plant,* Vol. 20, May 1932, pages 428-429.

Except for the omission of the plan view, this is the same as the article in *Blast Furnace & Steel Plant,* Vol. 18, Nov. 1930, pages 1707-1708. See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 24. MS (23)

Crucible Furnaces. G. L. CASSIDY. *Foundry Trade Journal,* Vol. 46, May 26, 1932, pages 319-323.

The author describes and discusses the history of the crucible furnace, the characteristics of plumbago, the coke-pit type of furnace, the types of coke generally available for use in these furnaces in Great Britain, the cost of crucibles, abuses to which crucibles are subjected in coke-pit furnace practice, various types of tilting furnaces (including oil-fired equipment, gas furnaces and electric furnaces), furnace atmospheres, the attack of fluxes, metal losses and labor costs (British practice). OWE (23)

Gas-Furnace Attains Temperature Exceeding Melting Point of Platinum. *Engineering & Mining Journal,* Vol. 133, Aug. 1932, pages 449-450.

A temperature of 1850° C. has been attained in the Degussa Lilliput furnace, a gas-heated laboratory furnace manufactured by Deutsche Gold u. Silber-Scheideanstalt, Frankfurt-on-the-Main, Germany. The maximum temperature was recorded in 15-20 minutes. The operation is on the principle of surface combustion, in contact tubes possessing a highly reactive surface. Low resistance to flow of gas and air, symmetrical distribution of flame, and highly effective insulation insure most favorable thermal conditions. High-grade corundum and MgO are used in furnace construction. 5 sizes are made with extreme melting volumes of 15-1000 in.³. A temperature of 2000° C. may be obtained in 1½-5 hrs. according to the size. WHB (23)

The Practice of the Pulverized Coal Rotating Melting Furnace. (Aus der Praxis des Kohlenstaub-Drehtrommelofens.) H. KALPERS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 24, 1932, pages 289-290.

Experiences with the new French Sesci furnace which is similar to the German Brackelsberg furnace are discussed. A short combustion chamber is arranged between the burner and the melting space. Rocking of the furnace is superior to continuous rotating. Metal waste through oxidation is less than 1%. Fuel consumption is 17.2% of the charge, power consumption is 7.5 kwh./ton, including coal grinding it is 12 kwh./ton Fe. The furnace lining stands 150 melts of machine casting, 130 melts of pearlitic Fe, 110-120 melts of malleable Fe. Composition of charges of various Fe is given. GN (23)

The Brackelsberg Furnace in the Enameling Plant. (Der Trommelofen im Emaillierwerk.) P. EYER. *Emailletechnische Monatsblätter,* Vol. 8, Apr. 1932, page 30.

In making enamel cast Fe in the Brackelsberg furnace a relatively high amount of steel scrap can be used. Fe made in the Brackelsberg furnace is ideal for enameling purposes. Few failures in enameling are due to the Fe. GN (23)

The Electric Enameling Furnace. (Der elektrische Emaille Brennofen.) M. BECKER. *Emailletechnische Monatsblätter,* Vol. 8, Aug. 1932, pages 59-60.

The paper discusses the advantages of electric enameling furnaces. GN (23)

Vacuum Casting. H. T. REEVE. *Metals & Alloys,* Vol. 2, Oct. 1931, pages 184-185.

An induction furnace set-up for melting and casting metals and alloys in vacuum is described. It has been used successfully to produce ingots of Pt up to 600 g. WLC (23)

REFRACTORIES & FURNACE MATERIALS (24)

Blast Furnace Linings. W. J. Rees. *Iron & Coal Trades Review,* Vol. 124, May 27, 1932, page 882.

The Department of Refractory Materials of Sheffield University carried on investigations on the durability of blast furnace linings which led to the following suggestions for the reduction of the corrosion of the lining: Resistance to slag attack is promoted by the use of well burned bricks of good shape, low permeability and good volume stability at high temperatures, made from aluminous clays with a refractoriness not below cone 30. The cement used should be finely ground but contain a high proportion of grog to avoid contraction on firing. Close jointing of the bricks is especially important. Resistant to C deposition is promoted by the use of bricks of low permeability, well burned and free from ferruginous segregations. An iron oxide content not higher than 2.5% seems desirable. Resistance to mechanical wear is promoted by use of bricks with a high cold-crushing strength, close texture and incipient vitrification appear to assist the retention of resistance to mechanical shock and abrasion at the temperatures of the upper parts of the blast furnace. Ha (24)

Refractory Materials. Alexander H. Hays. *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, pages 292, 294; Apr. 1932, pages 368, 370; May 1932, pages 453-454.

From *World Power.* General discussion of fire-clays, silica, volume changes and transitions of silica at various temperatures; high-alumina refractories such as bauxite, diaspore, sillimanite, mullite and corundum; chromite refractories, dolomite; magnesite; silicon carbide; zirconia and properties of refractories. MS (24)

Development of Refractories in 1931. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 59-60, 63.

Improvement in uniformity of clay and silica brick with regard to burn and size has lengthened life of furnace linings. A 9" straight 3" in thickness instead of 2½" has been introduced enabling 20% more wall area to be laid per mason hour. Chrome brick of coarser grain size, with an improved bond and heat treated in tunnel kilns give considerably longer furnace service. Being cheaper, they are supplanting magnesite brick in open-hearth and heating furnaces. Attempts are being made to develop a new type of magnesite brick. Encouraging results have been obtained in Europe with an electrically sintered magnesite brick having a softening point above 3000° F., and a melting point close to 5000° F. Good high alumina, mullite and sillimanite brick are beginning to find the places in furnaces where they may be substituted economically for the lower priced clay brick. Plastic refractories are coming into steel mill use because of lower prices and improved quality. Mills are salvaging brick bats from dismantled furnaces. Manufacturers and consumers are coöperating in making and interpreting tests. MS (24)

Open Hearth Furnace Regenerator Brick. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 116, 118.

Primary factor in manufacturing a regenerator brick is to have the lowest possible porosity. Dry-press method has done much to lower the porosity and to increase uniformity. Hard brick low in porosity accumulate less slag and cinder. It is generally understood that silica brick in regenerators are necessitated by improper design of furnace ports. Silica brick are unsuitable for the top courses because of their porosity. However, brick high in refractoriness, such as the high-alumina class, are suitable for this purpose so far as serving in high temperatures is concerned. More thought should be given to the placement of the bridge wall. Additional slag-pocket space can be provided by setting the bridge wall back into the chamber proper. This would prevent heavy particles of slags being carried into the regenerator flues. MS (24)

Some of the Newer Uses for Silicon Carbide. Charles McMullen. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 81-86.

See *Metals & Alloys,* Vol. 2, Aug. 1931, page 152. (24)

Sinter Corundum. (Sinterkorund als Werkstoff.) *Werkzeugmaschine,* Vol. 36, June 15, 1932, pages 205-206.

The paper discusses the production, properties and application of sinter corundum, made according to a special process by the Siemens Company. The excellent properties result from the following comparison:

	Mica	Porcelain	Steatite	Sillimanite	Sinter Corundum
Heat conductivity kg. cal/m. hr. °C.	.3	.84	1.25	1.45	16.8
Melting point °C.	1380	1670	1560	1816	2050
Insulating capacity up to °C.	600 (decomposes)	450 (softening of the vitreous component)	550	650	800 (crystalline)
Impact strength in cm. kg. at 600 °C.	...	45	50	120	180

GN (24)

Sinterkorund—A New Ceramic Material. *Industrial Chemist,* Vol. 8, Apr. 1932, pages 150-152.

5 references. Sinterkorund is essentially pure crystalline alumina containing 99.3 to 99.8% Al_2O_3. The method of preparing is described briefly. Chemical and physical properties are given. Tables of data such as thermal conductivity, thermal expansion, electrical resistance etc. are given. Many applications are cited. RAW (24)

An Apparatus for Testing Heat-Insulating Bricks. T. H. Blakely & J. W. Cobb. *Journal Society Chemical Industry,* Vol. 51, Mar. 11, 1932, pages 83-89T; *Blast Furnace & Steel Plant,* Vol. 20, May 1932, page 452.

The apparatus is used to measure the heat conductivity of firebrick, either one or two bricks being used, the difference in temperature of the air and of a dull black surface radiating and convecting freely to its surroundings being used as a measure of the heat flowing through the test brick. Considerable data on different kinds of heat insulating bricks are given. MS+VVK (24)

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MANUFACTURERS' LITERATURE REVIEWS

16 **Motors**—The Lincoln Electric Co., Cleveland, Ohio, has distributed a folder describing the construction of their "extra horsepower" motors.

17 **Alloys**—A folder of interest to foundrymen has been issued by H. Kramer & Co., 21st & Loomis St., Chicago, Ill. It describes the use of their Special, Intermediate and Fluxing alloys in producing improved castings.

18 **Stainless Steels and their Uses**—300 uses for stainless steels are discussed in detail in a 20-page booklet issued by Electro Metallurgical Co., 30 East 42nd St., New York, N. Y.

19 **Arc Welding Equipment**—Bulletin No. E-9 of the Hobart Bros. Co., Troy, Ohio, tells how factories may reduce material, labor, overhead and selling costs with welded steel and describes their welding equipment.

20 **X-Ray and the Foundry**—A pamphlet prepared by the Kelley-Koett Mfg. Co., Covington, Ky., discusses the application of X-ray inspection to castings, and welds. It is fully illustrated.

21 **Supertemp**—This steel was developed by Bethlehem Steel Company for use in parts that must retain their strength and be free from creep at high temperatures. A leaflet describing it including a chart showing its physical properties may be obtained from the company.

22 **Turbo-Compressors**—A bulletin describing the application of turbo-compressors to foundry cupolas has been issued by the Spencer Turbine Co., 521 New Park Ave., Hartford, Conn. They give the operator a dependable air supply under absolute control both as to volume and pressure.

23 **Furnaces**—A folder descriptive of their gas carburizing machines and gas heating machines for continuous heat treating may be obtained from the American Gas Furnace Co., Elizabeth, N. J.

24 **MacHempite**—A recent bulletin of the Mackintosh-Hemphill Co., Pittsburgh, Pa., describes their "MacHempite" heat treated alloy steel castings both as to physical properties and applications.

25 **Arc-Welded Rolled Steel**—A leaflet recently sent out by Lukenweld, Inc., Coatesville, Pa., stresses the use of Lukenweld construction in building bases and other units of machinery and equipment.

26 **Electric Fusion Weld**—In a folder issued by the Struthers-Wells Co., Warren, Pa., illustrations are shown of a welded vessel tested to 5000 pounds pressure with no sign of failure in the weld or steel plate.

27 **Blast Gates**—Bulletin No. 325 of the W. S. Rockwell Co., New York, N. Y., is devoted to their air-tight blast gates, illustrating their different styles of control and giving their dimensions. Bulletin No. 332 of the same company discusses their electric convector furnaces for drawing and bluing.

28 **Nickel Cast Iron News**—The October issue of this publication of the International Nickel Co., New York, N. Y., features an article entitled "Recommended Methods of Adding Alloys to Cast Iron." This issue also includes number fourteen of their "Intimate Chats on Metallography."

29 **Refractories**—Laclede Mullite, a non-spalling, slag resisting, non-shrinking, highly refractory brick is described in a leaflet distributed by the Laclede-Christy Co., St. Louis, Mo.

30 **Rust Prevention**—Bulletin No. 20 of the American Chemical Paint Co., Ambler, Pa., discusses the causes and prevention of rust. A.C.P. elastic primer for coating ship bottoms and decks is described.

31 **Die Castings**—An attractive booklet prepared by the New Jersey Zinc Co., New York, N. Y., includes charts and tables on the effect of aging treatments on tensile strength, impact strength and dimensions of Zamak alloys. Heat treatment for stabilizing the dimensions and properties of a zinc die casting alloy is given. A card distributed by the same company gives the original properties of die cast Zamak alloys.

32 **Heat Treating Baths**—A 25-page booklet distributed by the E. F. Houghton Co., Philadelphia, Pa., describes the types of salts used for heat treating operations that can be done in liquid baths and contains information on the design and operation of salt bath furnaces.

33 **Galvanized sheets**—A booklet prepared by the American Zinc Institute, New York, N. Y., discusses heavy-coated galvanized sheets for roofing and siding and the weight of zinc coating needed for long life.

34 **Alloys**—An index of standard and special alloys designed for use in brass, aluminum and iron foundry practice may be procured from Alloys & Products, Inc., New York, N. Y. The list of alloys is arranged in groups, classified as to purpose and cross-indexed as to their principal constituents.

35 **Electric Immersion Units**—The Harold E. Trent Co., Philadelphia, Pa., has issued a leaflet, TB-30, devoted to electric immersion units for heating oil. Prices and sizes are given.

36 **Brine Corrosion**—A circular distributed by the Dearborn Chemical Co., Chicago, Ill., tells about their treatment for controlling brine corrosion in circulating systems and tanks. Another of their leaflets discusses their special treatment No. 134 for quick removal of scale.

37 **Lead**—The November issue of *Lead*, published by the Lead Industries Association, New York, N. Y., illustrates several interesting and unusual uses of that metal.

38 **Arc Welders**—Portable, gas engine driven arc welders are described in Bulletin 901-A of the Burke Electric Co., Erie, Pa.

39 **Welding Rods**—A leaflet sent out by the American Brass Co., Waterbury, Conn., describes their Anaconda welding rods for bronze-welding.

40 **Phoenixloy**—The Pittsburgh Rolls Corp., Pittsburgh, Pa., has developed a new hard alloy roll, Phoenixloy, for both hot and cold rolling of all kinds of flat steel, copper, brass, zinc, aluminum and nickel. A folder describing it may be obtained from the company.

41 **Sil-Fos**—Bulletin No. 5 of Handy & Harman, 82 Fulton St., New York, is devoted to their new silver brazing alloy, Sil-Fos. This alloy melts at 1300° F., resists corrosion and works well with copper, brass, bronze, nickel, Monel metal, etc. The same company has prepared the 1932 edition of their "Review of the Silver Market," a 27-page booklet.

42 **Copper**—The January issue of the Bulletin of the Copper & Brass Association, 25 Broadway, N. Y., describes New York's largest apartment, illustrating the uses to which copper is put in its construction.

43 **Optical Instruments for examining and analyzing Metals**—This catalog prepared by the Bausch & Lomb Optical Co., Rochester, N. Y., is a most attractive and useful 125-page book. In addition to illustrating and describing all types of metallographic equipment, it contains several helpful articles and shows numerous interesting photomicrographs.

44 **Electric Furnace**—A recent pamphlet issued by the Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa., describes an installation of one of their furnaces used for manufacturing camshafts, crankshafts, brake drums, cylinders, etc.

45 **Radiography as a Tool in the Metal Industry**—The General Electric X-Ray Corporation, Chicago, Ill., is distributing reprints of this article by Fink and Archer. It is a 39-page booklet, and covers the subject as thoroughly as the space permits.

46 **Testing Soft Metals**—Bulletin H-6 of the R. Y. Ferner Co., Washington, D. C., is devoted to their Dwarf Brinell Press which is now available for testing soft metals, using a 250-kg. load instead of the 750-kg. load of the regular Dwarf Brinell Press.

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CURRENT

METALLURGICAL ABSTRACTS

A digest of the important metallurgical developments of the world

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Note:—The markings between the columns of abstracts will be there each month from now on. When the next index is made the references will be to tenths of pages, right or left, and the rule will simplify finding the material desired.

GENERAL (0)

Report of the National Physical Laboratory (England) for 1930. His Majesty's Stationery Office, London, 1931. Paper, 8 x 10½ inches, 295 pages. Price 12s 6d.

Work mentioned as in progress, but not yet reported on in detail, that is of direct metallurgical interest, comprises: thermal conductivities of stainless steel at high temperatures; change of temperature coefficient of Cu-Ni wire on drawing to smaller diameter, which is being followed by X-rays; materials for gages and stability of gages of "cloudburst" hardened and nitrided steels; wear tests on jewels and pivots (in this a 0.40% C, 12½% Cr steel was found to be the harder the higher it was quenched, from 850° to 1100°C., the cone hardness from 1100° being 590 kg./mm.^{2} Hardness vs reciprocal of square of diameter of grains was a straight line); corrosion fatigue of steels and of Al and Mg alloys; creep tests at high temperatures on Mo steel and Cu steel, and effect of flue gases; scratch-hardness testing; wear testing; friction and seizing tests on oils doped with lead ethyl; Al-Cu system; Fe-Cr system, Au-Cu system; heat-treatment in controlled atmospheres; surface tension of liquid metals; Be; Ti; gases in steel; corrosion of boiler plate; tungsten magnet steel; X-ray study of carbide residues from W steels and from Si steels; X-ray study of drawn Cu wire; orientation of electro plated deposits; electron diffraction; magnetic properties of Fe Cr and Fe Mn alloys; boundary lubrication; fatigue of single crystals; adhesion of bearing metal liners to bearing backs; seizure of bronze bushings; failure of connecting-rod studs; titanium chloride treatment of Al alloys; Mg Sb, Mg Ni and Ag Hg systems; dental alloys and amalgams; and methods of chemical analysis for high Ni Cr steels. H. W. Gillett (0)-B-

National Physical Laboratory Metallurgical Researches: Annual Report for the Year 1931. *Chemical Age,* London, Vol. 26, June 4, 1932, pages 35-36.

Brief account of the work of the National Physical Laboratory, the full report of which can be obtained from H. M. Stationery Office, price 15 s. The work of the past year has consisted in the study of alternating stresses on spring steels, X-ray crystal analysis, light alloys of Al and Mg, ductile Be and lubricating oils. VVK (0)

Research and the User. *Metallurgist,* Feb. 1932, pages 18-19.

The successful application of research is in a large measure dependent upon the user's appreciation of the value of the products which it puts at his disposal. The exaggerated claims of advertisers makes it difficult to put over a really meritorious product. The endeavor of many firms to get cheapness of product at the expense of quality also hampers the development of new and better materials. VVK (0)

Technical Education and the Steel Industry. I.—Montreal Technical School. *Iron and Steel of Canada,* Vol. 15, June 1932, pages 63-66.

After dealing with the manner in which the foundations of the present technical school system in Quebec were laid, the writer discusses very completely the Montreal Technical School which was founded in 1907. Attention is given to the various courses provided by the organization. OWE (0)

Third Progress Report of the Metallurgical Advisory Board to Carnegie Institute of Technology and United States Bureau of Mines, Oct. 1928 to Oct. 1931. F. N. SPELLER & JOHN B. BEATTY. *Mining & Metallurgical Advisory Boards Coöperative Bulletin* No. 52, 1931, 21 pages.

A complete review is given on the work carried out in the study of the physical chemistry of steel making, refractories, abnormality in steel and other fundamental problems in steel making. A list of the bulletins in which the results of these investigations have been laid down is published. Ha (0)

Recent Progress in the Field of Alloys and Their Treatment. (Recents Progres dans le Domaine des Alliages et de leur Traitement.) J. COURNOT. *L'Usine,* Vol. 41, May 20, 1932, pages 25-27.

The recent developments of ultra-light metals, Mg and Be, the more scientific treatment of cast Fe, heat treatment and welding are briefly reviewed. Most of the advances made are ascribed to intensive laboratory work to maintain which is considered of greatest importance. Ha (0)

Modern Research Organizations and the American Patent System. F. B. JEWETT. *Special Reprint Publication of the Bell Telephone Laboratories,* May 1932, 9 pages.

Address presented at the opening of the new United States Patent Office, Apr. 1932. The men who wrote the patent provision into the Constitution saw not only the tremendous stimulus to an ingenious people which such a system would provide, but, beyond and above that, the enormous advantage which would accrue to the nation as a whole as a result of the exercise of that stimulated ingenuity. The existence and operation of our patent system has had a vast influence, not alone in stimulating to the limit inherent ingenuity, but likewise in greatly accelerating the application of science to the affairs of everyday life. Our urgent problems of the present and the future are not concerned with stopping or diminishing the flow of new things into the current of life's activities, but are rather the problems of finding the best way of utilizing these things and of distributing the benefits of that use to the best advantage of all our citizens. The idea that there should be a holiday in scientific research, in the quest of new and useful applications of science, or a weakening of the forces such as those which result from the urge of our patent system, as many now urge, is an abhorrent thought. The industrial research laboratory as we understand it and as it exists today in its various stages of development in different industries, is merely an organization of intelligent men, presumably of creative capacity, specially trained in a knowledge of things and methods of science, and provided with the facilities and wherewithal to study and develop the particular industry with which they are associated. The modern research organization is an industrial tool which we have evolved in the past half century for the purpose of expediting the application of science to the affairs of life. The things which the industrial research laboratory is bringing into the patent system and which are destined to alter both its internal relations and its entire relationship to the rest of the social fabric are the kind and character of its products and the method of their creation. The industrial research laboratory is not a passing phenomenon. It has become a part of the vitals of our industrial life. Its creative works will, during the next few years, do more to modify the operation and administration of our patent system than any single factor which has yet entered into it. WAT (0)

The Journal of the Institute of Metals, Metallurgical Abstracts, No. 3, 1931. Vol. XLVII. Edited by G. Shaw Scott. Institute of Metals, London, 1932. Cloth, 5½ x 8½ inches, 854 pages.

This volume collects the monthly abstract bulletins of the Institute of Metals and provides a subject and author index. The index also covers volumes 45 and 46.

The number of abstracts included are 3705 of which 522 are on properties of metals; 357 on properties of alloys; 284, corrosion, erosion and protection; 149, structure; 265, analysis; 96, laboratory apparatus; 235, physical and mechanical testing and radiology; 54, pyrometry; 295, electrometallurgy and electro-chemistry; 343, industrial uses and applications; 39, heat-treatment; 160, joining; 285, working; 74, finishing; 200, foundry practice and appliances; 138, furnaces and fuels; 80, refractories and furnace materials; and 169, miscellaneous. It includes 101 book reviews. Richard Rimbach (0)-B-

PROPERTIES OF METALS (1)

Beryllium and Its Alloys. (Le Beryllium et Ses Alliages.) *L'Usine,* Vol. 41, Apr. 15, 1932, page 29.

Methods of production and physical properties of Be are briefly described. The importance of Be as an alloying material is discussed and properties of Be- bronzes with 1.3 to 5% Be described which lend themselves particularly well as fatigue resisting materials for springs; the electric conductivity is 7 to 19 against 7 to 10 for P-bronze. Alloys of Be and Ni are very heat-resisting and hard; they maintain their mechanical resistance up to 400°C. Binary alloys of Be and Fe are of no great practical importance, while ternary and quaternary alloys show a very fine grain. A Ni steel with 1% Be and 4% Ni has a Brinell hardness of about 600. Possible further extensions of the use of Be are discussed. Ha (1)

Rhenium. (Das Rhenium.) W. Schröter. Sammlung chemischer und chemischtechnischer Vorträge. F. Enke, Stuttgart, 1932. Paper 6¼x9¼ inches, 59 pages. Price 5.50 RM.

The isolation of Re in pure compounds was announced in 1925, and a few milligrams of the metal were prepared in 1926. In 1928, a gram was prepared, and now several kilos of metal are obtained per year. Starting with Gadolinite containing five-thousandths of 1% of Re, it is separated as a sulphide, chiefly of Mo and V with some As, Pb, Pt and Ir, which contains 1½ to 2% Re. By oxidation, solution and recrystallization potassium perrhenate is obtained, the pure salt being valued at 6.50 RM/gram. Acid perrhenate solutions can be electrolysed to give finely divided Re, or large crystals of the metal can be obtained by thermal decomposition of the halide vapor phase. Finely divided Re sintered at high temperatures is ductile enough for hot-working into sheet and wire. The metal is valued at 13 RM/gram. The metal can also be made by hydrogen reduction of perrhenate at 1000°C., to a powder containing some free potassium, removable by water. This appears to be the preferred method of production. Specific gravity directly determined is about 20, by X-ray 21.4. Lattice structure is hexagonal close-packed, a = 2.752, c = 4.448, a/c = 1.616.

A drawn Re wire of 0.25 mm. diameter gave 72,000 lbs./in.^{2} tensile strength, 24% elongation. The strength is not affected by annealing in hydrogen, oxygen or oxidizing gases. The m.p. is somewhere around 3150° C. The coefficient of thermal expansion varies with crystallographic direction, from 4.7 x 10^{-6} for the a axis to 12.5 x 10^{-6} for the c axis. Electrical resistance is about that of W.

It alloys with W forming the intermetallic compound W_2Re_3 (m.p. 3000° C.) which forms eutectics at about 50 and 67 atomic % Re with W and Re with m.p. of about 2900° and 2800° C. The metal is soluble in HNO_3, slowly in H_2SO_4, insoluble in HCl or HF, attacked by fused alkalies. It is more stable in O_2, steam and CO_2 than W. It is attacked by air at 1000° C. but is stable in hydrogen. Steam attacks it at 1900° C., pre-treatment in hydrogen tends to minimize this. The occurrence of Re and the properties of its chemical compounds are discussed. H. W. Gillett (1) -B-

The Ferro-Magnetic Moments of the Elements and the Periodic System. (Les Moments Ferro-Magnétiques des Eléments et le Systeme Periodique.) Charles Sadron. *Annales de Physique,* Vol. 17, May/June 1932, pages 371-452.

Very exhaustive experiments were made to determine the variations of the absolute saturation of Ni and Co alloys as a function of the alloying material in the simple case of solid solutions. The properties of Ni-Mn and Co-Mn suggest that the Mn-atom is orientated parallel or anti-parallel to the ferro-magnetic atoms surrounding it. The Mn atom can therefore be attributed a moment of 15.0 magnetons. According to the enlarged theory from this result the atomic moments of Cr, Mo, W, Pt, Pd, Ru, V, Sb, Si, Sn, Al, Zn Cu, Au have been determined from which it follows that for elements in the same column of the periodic classification the value of the atomic moment is the same and that in the same line—that of Fe—the moment varies linearly as a function of the atomic number. The rate of variation per supplementary electron is from +5.25 magnetons of Weiss from atomic number 19 to 23 and —4.0 from 23 to 28. The experiments are described in detail and the results tabulated. Ha (1)

Magnetism of Colloidal Gold. V. I. Vaidyanathan & Balwant Singh. *Nature,* Vol. 128, Aug. 1931, pages 302-303.

Colloidal Au was prepared by reduction of $HAuCl_4$ with HCHO, coagulated and dried in the complete absence of O_2. Its magnetic susceptibility, determined in a highly sensitive Curie balance, is $\gamma = 0.0804 \times 10^{-6}$, as compared with 0.15 for massive Au. It is suggested that the colloid is largely amorphous, or else that it contains a small quantity of Au in a crystalline structure different from cubical. WAT (1)

The Shift of the Transmission Band of Silver by Cold Working. Henry Margenau. *Physical Review,* Vol. 40, June 1932, pages 800-801.

It is pointed out that the shift of the reflection minimum of Ag, occurring as a consequence of cold working the Ag surface, can be understood on the basis of Kronig's theory of metallic dispersion as a result of the change of the lattice constant. Correlation with known values of the density changes leads to satisfactory agreement. WAT (1)

On the Electromotive Forces Generated by Friction between two Metals. Daizo Nuiyama. *Proceedings Physico-Mathematical Society of Japan,* Series 3, Vol. 14, Mar. 1932, pages 93-107.

Results of experiments on the e.m.f. between 2 metal pieces in contact and in relative motion are discussed. All metals were tested against a steel disk and it was found that each element acts in its own characteristic way towards the steel disk. In some cases the e.m.f. increases with the relative velocity while in others the e.m.f. reaches a maximum value at a certain relative velocity. The elements tried were C, Mg, steel, Co, Ni, Cu, Zn, Cd, Ag, Sn, Sb, Pb and Bi. The curves are reproduced. Ha (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

The Alloys of Silver, Copper and Zinc. *Metallurgist,* Jan. 1932, pages 5-7.

A correlated abstract with special attention to the work of Shuzo Ueno, reported in the Anniversary Volume, Institute of Chemistry, Imperial University, Kyoto, 1930, page 76. Ueno determined the physical properties of 2 series of alloys, one having a Zn content of 30% and the other containing only 10% Zn with varying ratios of Ag and Cu in each series. The series of alloys containing 30% Zn show a gradual increase in hardness with increasing Ag content, until the Ag reaches about 50%, at which stage the alloys have a β structure, and further additions of Ag result in a gradual lowering of the hardness. With the 10% Zn series the maximum hardness appears at 30% Ag, at which composition the alloys have a structure like that of the binary Ag-Cu eutectic. Malleability tests were made with alloys in the 10% Zn series only and indicated that alloys containing 10% Zn and 10% Ag are fairly malleable, but that the malleability falls off considerably when the Ag content is raised to 20 or 30%, while with an increase of Ag beyond that amount the malleability gradually increases. To test the corrosion in acid and in ammoniacal solutions the series of alloys with a constant Zn content of 30% was taken, and the results showed that the alloys most resistant to corrosion in these solutions have the composition corresponding to the ternary β solid solution in the Ag-Cu-Zn system. The corrosion of the ternary alloys, of the compositions tested, in HCl increases with the increase in Ag content until it reaches a maximum at 20% Ag where the alloys have the binary eutectic structure of Ag and Cu. Beyond this limit the addition of Ag makes the alloys more resistant to corrosion, until the maximum is reached at the Ag-Zn corner. This points to the fact that the α and β solid solutions are more resistant to corrosion than the eutectic. In the case of ammonia the attack is fairly uniform with alloys containing up to about 25% Ag, but there is a very considerable increase in corrodibility with 30% Ag. With increases of Ag content beyond this percentage there is again a marked decrease in amount of attack by ammonia. VVK (2)

Straight Copper-Lead Alloys versus Leaded Solid-Solution Bronzes for Heavy-Duty Bearings. F. R. Hensel & L. M. Tichvinsky. *Transactions American Society of Mechanical Engineers,* Vol. 54, Apr. 30, 1932, Iron & Steel, pages 11-24.

A metallurgical investigation of various bronze bearing metals and a comparative study of their bearing performance for use in heavy-duty bearings led the authors to the following conclusions: The Pb content and its distribution in straight Cu-Pb alloys depends primarily on the casting temperature; with lower temperatures quicker solidification takes place and a larger amount of Pb is retained in suspension. Pure Cu-Pb alloys have a tendency to pronounced Pb segregation if the Pb content exceeds 25%. Small amounts of impurities have an appreciable effect in retaining a good suspension of the Pb in the Cu and reduce the influence of the casting temperature on the Pb content and its distribution. The physical properties of straight Cu-Pb alloys are nearly independent of the casting temperature within the range of 1050°-1150° C. and depend only slightly on the Pb content within the limits of 12-25% Pb. The Brinell hardness decreases with increasing Pb content. The physical properties of straight Cu-Pb alloys have values about ½ those of solid solution bronzes of the same Pb content; the electrical conductivity is about 6 times as high, but is lowered considerably by small amounts of impurities, especially P and Sn. In general, a much better performance was obtained in bearing tests, the temperatures being considerably lower with straight Cu-Pb alloys than with solid-solution bronzes due to their higher heat conductivity and low friction coefficient. Bearings with steel backing can be made by a centrifugal casting process. Any speed between 1000 and 2000 r.p.m. may be used for a straight Cu-Pb bearing while a 2" to 3" diameter bearing of solid solution bronze should not run higher than 1500 r.p.m. All test data are given in detail and numerous micrographs show the influence of different methods of preparation. Ha (2)

Copper-Phosphorus Alloys with High Phosphorus Content. (Kupfer-Phosphorlegierungen mit hohem Phosphorgehalt.) A. Burkhardt, W. Linicus & G. Sachs. *Metallwirtschaft,* Vol. 11, June 10, 1932, pages 331-333.

Phosphorus forms a compound Cu_3P which contains 14.1% P and this forms an eutectic with Cu containing 8.3% P. The higher P alloys, up to 8.3% P, can be easily rolled and pressed above 300° C., but at lower temperatures they suddenly become brittle. The rolled alloys have better tensile strength and elongation than the cast alloys. The rolled 8% P alloy had a tensile strength of 55 kg./mm.^{2} and Brinell hardness of 230. Tensile tests, including elongation and reduction of area, were made on alloys containing 0 to 12% P at temperatures of -200° to +500° C. The test bars were cast and then hot rolled. The tensile strength of pure Cu decreases gradually with rising temperature while the ductility increases. With P additions the tensile strength is higher at low temperatures but falls off rapidly, becoming practically 0 at 500° C. The elongation and reduction in the higher P alloys start at 0 and increase very rapidly to about 100% at higher temperatures. In the 12% P alloy the reduction of area increases from 0 to 80% between 300° and 400°. Cu-P alloys of eutectic composition have been used as hard solders on account of their low melting point and high fluidity. Sheets, bars and tubes can be made from these alloys. The resistance of alloys with more than 8% P towards hot H_3PO_4 is very good. CEM (2)

Duralumin-alloys. (Duraluminlegierungen.) K. L. Meissner. *Berichte der 5. Internationalen Luftfahrttagung,* Haag 1930, Vol. 1, pages 836-850.

Report on the properties of duralumin. Definition of the expression "duralumin-alloys." Influence of aging at different temperatures on the properties of duralumin. Intended suppression of aging. Possibility of repeating aging. Increase in corrosion resistance by rolling on metallic coatings. Corrosion behavior of plated material. Reference to new tendencies in future development. GG (2)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)

Aluminum in Brass Causes a Resistant Surface Film. Correspondence from W. ROSENHAIN. *Metal Progress,* Vol. 21, May 1932, pages 70-71.

Discusses the possibilities of Al brass (2% Al) which is proving successful as a material for condenser tubes where corrosion conditions obtain. WLC (4)

Study of the Corrosion of Metals. (Etudes sur la Corrosion des Metaux.) ARZENS. *L'Usine,* Vol. 41, May 6, 1932, page 31.

In a paper read before the Association Technique de Fonderie the author submitted tabulated results of tests carried out with steels protected in different ways against corrosion and attack by different agents; the figures express the change in weight of the samples in cg. of material/cm.² surface. The figures are as follows:

	Bare Steel	Parkerized	Red Pb covered	Ni Plated	Tinned	Galvanized
Normal City Atmosphere	13	0	0	3	1	1
City water	−52	0	−2	−32	0	11
Sea water	44	1	−33	−27	−9	27
Carbonated water	−55	0	−2	−16	−1	−32
Air-saturated water	3	1	−1	−3	0	7
Water vapor	38	0	−68	−9	1	7
Ammonia solution	−47	1	−4	−25	0	−1
Acetic acid	−512	−80	−211	−590	−98	−669
Hydrogen peroxide	−124	−4	−63	−40	0	3
Sodium carbonate	1	−4	−12	−1	−15	7
Sodium bicarbonate	−8	−3	−26	0	−16	36
Sodium bisulphite	−39	−65	−117	−136	−121	−243

Ha (4)

A Note on the Tarnishing of Chromium-Plated Brass. W. M. PHILLIPS. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 397-399.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 163. (4)

Rust Proofing of Iron and Steel. *Crushing & Grinding,* Vol. 1, Mar.-Apr. 1932, page 139.

"Parkerizing" and "Bonderizing" are described. Insoluble phosphates are not formed on Fe unless a di-H phosphate of the general formula $M(H_2PO_2)_2$, some free H_3PO_4 and some ferrous mono-H phosphate are present in the treatment bath. Such di-H phosphates may be prepared on a large scale and in a stable form without working in an inert atmosphere. Fe, Zn, Mn and Cd give the most suitable di-H phosphates. A mixture of Mn and Fe^{++} salts was best. The presence of small quantities of $Cu_3(PO_4)_2$ in the bath speeds up the reaction. Consumption of the phosphate in Parkerizing is 14-16 lbs./1000 ft.² and in Bonderizing 11 lbs./1000 ft.² The correct load in Parkerizing is 1 ft.²/gal., for Bonderizing 1 ft.²/2½ gal. The normal time for the latter is 10 min. AHE (4)

On the Corrosion Problem. (Zur Korrosionsfrage.) HANS HEBBERLING. *Bautechnik,* Vol. 10, Aug. 5, 1932, pages 436-437.

The paper deals particularly with the prevention of corrosion by the use of Cu steels and the protective action of minium. The various opinions as to the action of Pb_3O_4 are discussed. 7 references. GN (4)

Corrosion Protection of Iron. (Korrosionsschutz für Eisen.) M. LEPINGLE. *Metallwaren Industrie und Galvanotechnik,* Vol. 29, Apr. 1931, pages 141-142.

The various protection means as vaseline and other fats, lacquers and metallic coatings (Cr, Zn, Sn, Pb, Cd) are dealt with. The effect of the metallic coatings is explained by means of the electromotive series of metals and the potentials of metals against 1/1 *N* solutions of their salts. Sn represents a poor rust protection in spite of its low tendency toward oxidation. Pb is usually out of question due to its softness and toxicity, while Cd acts as an excellent anti-rust coating. The most economical surface coating is galvanizing. Cd plating can only compete on account of the smaller metal consumption for plating purposes and due to its superior corrosion protection. Outdoor tests with a 0.0025 mm. layer showed a life time of 4-5 months, whereas no rusting was observed during 14 months, when a layer of 0.005 mm. was used. At the same current density, twice as much Cd can be deposited as Zn during the same period of time. EF (4)

New Method for the Protection of Precious Metals against Oxidation. (Das neue Verfahren zum Schutze von Edelmetallen gegen Oxydation.) H. MEYEN. *Deutsche Goldschmiedezeitung,* Vol. 35, Jan. 30, 1932, pages 54-55.

Experiences with Parabernol (composition not given), a lacquer-like substance for protecting precious metals against oxidation and air containing H_2S are discussed. The high resistivity against H_2S is preserved even after the Parabernol coating is removed. GN (4)

Protection of Steel and Iron Structures in Connection with Gas Manufacturing Plant. D. RITCHIE. *Gas Journal,* Vol. 199, Aug. 3, 1932, pages 254-255.

The article discusses the means of protecting Fe and steel from rust by moisture, S in various forms, sulphurous and sulphuric acids, and salt water. The paint used to protect pipes would be more satisfactory if more attention were paid to the priming coat. Berger's "Protmeum" contains Pb chromate and peroxide of Fe and orange Pb. It dries in from 6 to 8 hours and is easy to work. Fish oil is also a good ingredient in primers. Galvanized Fe requires a special type of primer. Semi-glass, the second step, is the undercoating paint. The finishing coat must be hard, tough, and impervious to water, H_2S and other fumes. Ti oxide mixed with Zn oxide produces an extremely durable paint. Al paint gives the best finish when applied by spray, although stippling is also satisfactory. It is a very popular finish for gasholders. A graphite paint gives an elastic, chemically inert paint which will not permit the passage of air or water and is not affected by sulphurous vapors. Chimneys of metal require a paint of graphite and a heat-resisting medium. Smoke-stack paint dries with a dull finish but gives maximum durability. MAB (4)

·ILLIUM·

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Acetic Acid
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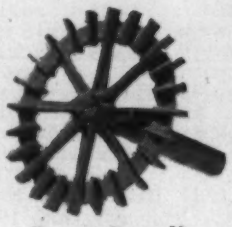
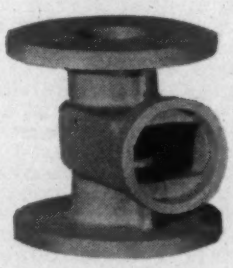
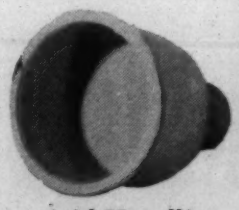


Pump Impellers and Housings



Valve Parts and Fittings

Spray Nozzles, Drying Equipment



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A Symposium on Pipe Corrosion and Corrective Measures. *Journal American Water Works Association,* Vol. 23, Oct. 1931, pages 1540-1564.

A discussion participated in by Malcolm Pirnie, Elwood L. Bean, James M. Caird, Keith R. Chinn, R. W. Fitzgerald, Edward S. Hopkins, E. G. McConnell, R. S. Weston and F. E. Hale, in which their respective experiences with corrosion by municipal water supplies were given. In general corrosion can be controlled by treatment with lime. VVK (4)

Degree of Corrosion as Related to Pipe Friction. ARTHUR T. CLARK. *Journal American Water Works Association,* Vol. 23, Oct. 1931, pages 1565-1576.

The loss of friction in a pipe line is dependent on the condition of the interior surface such as tuberculated, cement-lined, Talbot lined, etc. A nomogram is given showing the direct relation between size of main, Williams & Hazen coefficient of roughness, the discharge and the resulting theoretic horse power. VVK (4)

Corrosion in Neutral Waters. IRA D. VAN GIESEN. *Journal American Water Works Association,* Vol. 24, July 1932, pages 984-994.

A general review of the fundamentals of corrosion and scale formation. VVK (4)

Corrosion Stability of Ferrous and Non-Ferrous Metals and Alloys. (Korrosionsbeständigkeit von Eisen- und Nichteisenmetallen und -legierungen.) J. N. FRIEND. *Korrosion und Metallschutz,* Apr. 1932, page 92; *Die Metallbörse,* Vol. 22, May 28, 1932, page 675.

Report on 3 years tests with Pb, Zn, Sn, Al, Cu, Ni and various alloys of Fe, Cr, Ni, Cu and Zn exposed to sea-water attack in the docks of Southampton. Fine-grained brass proved to be superior to coarse-grained material. A 70/28 Ni-Cu alloy displayed remarkable corrosion stability. High grade Zn and Sn are less susceptible to corrosion than lower commercial brands. Additions improve the corrosion resistance of Cu. Drawing, riveting and cold working do not materially influence the corrosion of Ni and Cr steels in contrast to welding. Maritime fauna do not affect corrosion while alive. Dead mussels favor local pittings on alloyed steels, Ni and low Cu bearing Ni alloys. Alloyed steels displayed relatively good corrosion stability, but former investigations were confirmed that these steels are liable to corrode locally. EF (4)

On the Dissolution of Metals in Acids. J. N. BRÖNSTED & N. L. ROSS KANE. *Journal American Chemical Society,* Vol. 53, Oct. 1931, pages 3624-3644.

This investigation studies the dissolution of sodium from sodium amalgam in acid, alkaline, buffered and nonaqueous solutions with a view to interpret the mechanism of the reaction. MEH (4)

Sulfuric Acid vs. Metals. H. E. SEARLE & R. WORTHINGTON. *Bulletin T-3, International Nickel Company,* pages 2-12.

The corrosion effects of H_2SO_4 under various conditions are explained and its action particularly on Monel metal and other Ni alloys discussed. The methods of measurement of corrosion are briefly explained; it is usually expressed in average weight loss in mg./dm.^{2} of area per day or the average penetration of a surface per year in inches when continuously exposed to the corrosive, that is, the average decrease in thickness over the whole surface of a metal sheet on one side. The results of tests on several metals are reproduced in curves. Monel withstands the corrosive effect of dilute H_2SO_4 and is used for pickling tanks and crates. The galvanic and concentration cell corrosion is explained and the order of metals according to their forming galvanic couples given, with Al on the anodes (corroded) end to Ag solder on the protected (cathodic) end. A table of physical properties of some corrosion-resisting metals in the form of annealed rolled bars is added. An appendix deals with derivation, properties and uses of H_2SO_4. Ha (4)

Oxygen Effect on H_2S Gas Corrosion. JOHN M. DEVINE, C. J. WILHELM & LUDMIG SCHMIDT. *Oil & Gas Journal,* Vol. 30, Apr. 7, 1932, pages 16-86.

A reprint of the U. S. Bureau of Mines, Report of Investigations No. 3160. See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 263. VVK (4)

The Handling of Corrosive Gases. THOMAS H. CHILTON & WILLIAM R. HUEY. *Industrial & Engineering Chemistry,* Vol. 24, Feb. 1932, pages 125-131.

Gases are corrosive at ordinary temperatures only in the presence of moisture. Resistance to moist gaseous corrosive agents can be obtained in the same way as resistance to the same agents when dissolved in water, and available materials and methods for the common cases are listed. Direct gaseous attack at high temperatures is of 2 types: surface compound formation and disintegration. Some principles are laid down for resistance to surface attack. Metals and alloys for resistance to high-temperature attack are listed from several sources. 23 references. MEH (4)

Wear of Grates by the Heat Effect of Upper Silesian Fuels. (Rostverschleiss durch Wärmeeinfluss bei oberschlesischen Brennstoffen.) P. FUCHS. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Jan. 1932, pages 7-9.

The paper studies the effect of higher temperatures on the deterioration of 8 cast Fe grates. The variations of chemical composition were considerable, as the following table shows:

	Si %	Mn %	P %	S %	C %
Mean value of the 8 grates	1.72	.53	.67	.11	3.31
Suggested composition by D I N	1.0–2.0	.5–.8	<.3	<.08	3.5–4.0
Maximum values among the 8 grates	2.12	.84	1.06	.18	3.60
Minimum values among the 8 grates	.95	.33	.37	.07	2.95
Difference between maximum and minimum composition	1.17	.51	.69	.11	.75

The prime cause of wear is the decarburization and subsequent scaling due to too high temperatures on the grate. High temperatures on the grates are caused by improper adjustment of grate and fuel. The chemical attack of slags does not bring about considerable wear. However, the physical behavior of slags considerably increases the wear. Standardization of the chemical composition of grates is suggested. The above-mentioned results are substantiated by practical experiences which demonstrate the relations between chemical composition, arrangement of the grates and fuel on its wear. 3 references. GN (4)

The Corrosion of Metals by Milk. C. G. FINK & F. A. ROHRMAN. *Journal Dairy Science,* Vol. 15, Jan. 1932, pages 73-86.

Review of previous work and comparison of the former results with those of the present authors. Discussion of the nature of corrosion by milk and of the Fink theory of this action. Description of tests made from material in a pasteurizing plant in New York. Data on Ambrac A and B (75 Cu, 5 Zn, 20 Ni, and 65 Cu, 5 Zn, 30 Ni, respectively), Monel metal, Nickel, "Hyblum" (95 Al, 5 Ni), and 2 materials of the 18-8 type. (4)

The Solubility of Metals in Milk. H. T. GEBHART & H. H. SOMMER. *Journal Dairy Science,* Vol. 15, Jan. 1932, pages 24-28.

Loss of weight tests on test pieces prepared to simulate well-cleaned service surfaces. Observations on effect of (1) acidity, (2) dissolved O, (3) temperature, (4) steam sterilization, (5) cumulative corrosion losses with intermittent exposure and (6) type of tarnish developed. Metals tested: Al, Ni, Zn, tinned Cu, galvanized Fe, Allegheny metal, stainless steel, Monel metal, brass, nickel silver. 34 references. (4)

The Influence of the Surface Condition on the Corrosion of Stainless Steels (Influence de l'état de surface sur la corrosion des aciers inoxydables). JEAN COURNOT. *Comptes Rendus,* Vol. 193, Dec. 21, 1931, pages 1335-1337.

The author describes experiments in which the Erichson test was used to differentiate between the behavior of the different materials, on 2 steels containing 18% Cr and 8% Ni, and on one steel containing 13% Cr. The condition of the surface of the different steels was as follows: (a) condition as received; (b) sand-blasted—40-grain; (c) cleaned for 30 min. in a 10% aqueous solution of HNO_3; (4) polished with 00 emery; and (5) polished with 000 emery. The following table, in which the results of the corrosion tests are given, accompanied the article.

In concluding, the author comments on the remarkable stability of the high-quality stainless steels after thorough polishing.

Steel Tested	Surface Condition	Loss of Weight in mg/dm^2			Reduction in the Load Causing Rupture %			Reduction in Depth of Draw %		
		Periodic Immersions 20 days	Spray Test 20 days	Perhydrate Test 2 days	Periodic Immersions 20 days	Spray Test 20 days	Perhydrate Test 2 days	Periodic Immersions 20 days	Spray Test 20 days	Perhydrate Test 2 days
18 Cr 8 Ni—(General attack)	As received	25.5	81.0	44.5	0.8	4.0	4.9	2.0	2.7	3.2
	Sanded (40 grain)	18.5	34.5	42.5	1.6	4.9	4.0	2.7	2.5	3.4
	Pickled in 10% HNO_3 for ½ hr.	17.0	44.0	33.0	2.5	4.0	4.0	3.7	3.0	3.4
	Polished with 00 emery	8.5	24.0	17.5	0.8	1.6	0.8	1.0	2.0	1.7
	Polished with 000 emery	1.5	15.5	10.5	0	0	0	0.2	1.2	0.7
18 Cr 8 Ni—(Localized attack)	As received	62.0	118.5	131.0	8.3	11.7	17.4	2.1	3.2	3.2
	Sanded (40 grain)	29.0	48.0	69.0	17.0	20.4	18.5	5.8	6.1	6.4
	Pickled in 10% HNO_3 for ½ hr.	44.0	58.5	61.0	12.1	20.2	16.6	4.0	8.7	6.1
	Polished with 00 emery	22.0	29.5	18.5	6.1	13.6	7.6	2.9	4.8	4.8
	Polished with 000 emery	12.5	17.5	10.5	4.5	7.6	6.1	2.7	3.4	2.9
10-13 Ni —	As received	1940	1126	1355	20.0	10.5	8.0	18.9	14.3	8.9
	Sanded (40 grain)	877	900	1090	23.0	28.0	13.0	19.4	22.8	13.9
	Pickled in 10% HNO_3 for ½ hr.	456	601	668	16.0	18.0	25.7	14.4	16.1	13.9
	Polished with 00 emery	357	290	438	14.0	14.0	6.5	7.2	9.4	8.9
	Polished with 000 emery	249	165	238	14.0	6.0	6.0	8.3	8.3	8.3

OWE (4)

Metal Losses in Condensers and Tried Methods for Combating Corrosion. SHERMAN S. SHAFFER & JOHN POLLOCK. *Oil & Gas Journal,* Vol. 30, Mar. 31, 1932, pages 78-80.

A general discussion of the corrosion of condensers in the oil industry. Data are given showing that, in regard to the cooling water used, salt water is most corrosive and temperature and oxygen content increase the rate of corrosion. Internal corrosion will vary with the type of crude oil and the kind and treatment of the various fractions. External protection can be partially effected by the use of contact Zn or the addition of such substances as dichromate and silicate to the cooling water. The most effective internal protection is the use of ammonia. As regards corrosion-resistant metals, a few ferrous alloys tested in the stream from distillation of acid treated naphtha showed that metals of the 18-8 Cr-Ni type show good resistance; low Cr steel shows only low resistance to this type of corrosion. An alloy cast Fe of the following composition: Ni 12-15%, Cr 3-4%, Cu 5-7%, Si 1.5%, total C 3% has proved very resistant in such a service. Cast Fe on account of its low cost and moderately long service, is reasonably economical, but a trial of the above alloy may justify the higher capital expenditure. The authors summarize as follows: "After consideration of the various means for obtaining longer life from condensing equipment, it appears that ammonia will prove the most satisfactory chemical for this purpose and its use in conjunction with cast iron will in all probability be preferred over that of corrosion resistant alloys involving high capital expenditure." VVK (4)

Corrosion of Mild Steel and Alloys by Hydrogen Sulfide at 500° C. and Atmospheric Pressure. A. WHITE & L. F. MAREK. *Industrial & Engineering Chemistry,* Vol. 24, Aug. 1932, pages 859-861.

Mild steel is rapidly attacked by H_2S at 500° C. and atmospheric pressure. Under the same conditions, Al is very slightly attacked even after exposure for 3 weeks. High Cr steels (12 to 20% Cr) resist the corrosion, and the resistance increases with increase in the Cr content. The presence of high proportions of Ni are detrimental to the corrosion resistance imparted to the alloys by Cr. 8 references. MEH (4)

An Interesting Example of the Internal Corrosion in Brass. (Ein interessantes Beispiel für die innere Korrosion von Messing.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 7, 1932, page 314.

Abstract of the paper by G. Mandrau in *Aciers Spéciaux, Métaux et Alliages,* Vol. 6, June 1931, pages 293-294. See *Metals & Alloys,* Vol. 3, July 1932, page MA 204. GN (4)

Corrosion Tests on Condenser Tubes. *Transactions American Society of Mechanical Engineers, Section Fuels & Steam Power,* Vol. 53, 1931, pages 247-251.

This is a report of tests made by A.S.M.E. Special Research Committee to determine the extent of the influence of air on tube material. The method used was to make comparative corrosion tests with solutions saturated with air and under vacuum. The solutions were KCl in various concentrations with Admiralty brass anodes and Cu cathodes; the loss of brass was determined and represented in curves. It can be clearly seen that the loss in solutions saturated with air is almost twice that under vacuum. A few special cases of corrosion are discussed. Ha (4)

Corrosion of Bronzes by Vinegar. E. M. MRAK & J. C. LEROUX. *Industrial & Engineering Chemistry,* Vol. 24, July 1932, pages 797-799.

8 bronzes and their chief components (Cu, Sn and Pb) were exposed to still, aerated, and sprayed vinegar. All the metals tested, except Sn, corroded most in the spray tests and least in the immersion tests. Sn corroded most in the aerated vinegar and least in the spray tests. Pb corroded more rapidly than any other metal tested. All bronzes tested corroded sufficiently under all conditions used to cause considerable contamination of the vinegar with heavy metals. MEH (4)

Effect of Cold-Rolling and Annealing on Solubility of Cartridge Brass in Chromic Acid. JOSEPH D. PARENT. *Industrial & Engineering Chemistry,* Vol. 24, Mar. 1932, pages 318-320.

12 references. It is concluded from this study that the grain size in itself gives no indication of the corrosion loss to be expected, and that the important factors are inner stresses, chemical homogeneity, physical homogeneity and orientation of the grains. MEH (4)

Long Time Tests on the Corrosion of Condenser Tubes Under Service Conditions. (Dauerversuche über die Korrosion von Kondensatorrohren im Betrieb.) P. REUTER. *Elektrizitätswirtschaft,* Vol. 31, Jan. 31, 1932, pages 6-13.

The failure of 50,000 condenser tubes in 12 different condenser units after 12,000 service hours precipitated this investigation which refers to 414 tubes picked out as samples. The order of merit of the various material, which were furnished by 9 different manufacturers, showed the following results with respect to the best corrosion resistance: (1) 70.55% Cu, 28.13% Zn, 1.01% Sn, 0.03% Fe, 0.04% Ni and traces of As, Pb, S. (2) 69.78% Cu, 29.13% Zn, 0.99% Sn, 0.02% Pb, 0.03% Fe, 0.05% Ni and traces of As and S. (3) 84.74% Cu, 14.92% Ni, 0.24% Mn, 0.03% S and traces of Zn. (4) 98.68% Cu, 1.26% Sn and traces of Sb, As, Pb, Fe, S, Zn. (5) 70.61% Cu, 28.36% Zn, 0.96% Sn, 0.03% Pb, 0.04% Fe and traces of As and S. (6) 96.77% Cu, 2.92% Al, 0.26% Zn. 0.01% Fe and trace of S. (7) 53.80% Cu, 38.25% Zn, 4.74% Ni, 1.28% Mn, 0.94% Al, 0.82% Fe, 0.15% Sn, 0.14% As, 0.10% Pb and traces of Sb and S. (8) 70.57% Cu, 29.34% Zn, 0.05% Fe, 0.02% Pb, 0.016% S, 0.006% Sn and trace of As. (9) 69.37% Cu, 29.60% Zn, 0.96% Sn, 0.04% Fe, 0.03% Pb and traces of As and S. Microstructural investigations revealed that the coarse grained material withstood the corrosion attack to a greater degree than the fine crystalline tubes which is contrary to the observations of other investigators. Tests were conducted with mercury nitrate, but it was proved that internal stresses did not play an essential role in failure. Testing for physical properties (tensile strength, elongation, Brinell Hardness) did not yield a clue either. The widely different behavior of the same type of brass alloys is ascribed to non-metallic inclusions, mainly oxides. EF (4)

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STRUCTURE OF METALS & ALLOYS (5)
Structure & X-Ray Analysis (5b)

The Crystal Structure of Electrodeposited Alloys. Silver-Cadmium. CHARLES W. STILLWELL. *Journal American Chemical Society,* Vol. 53, June 1931, pages 2416-2417.

The crystal structures of Ag-Cd alloys, ranging in composition from 20 to 96% Cd, have been obtained from X-ray diffraction data. The alloys were deposited at room temperature according to the Stout method using a current density of one ampere. In general, the structures of the alloys are quite different from those of thermal alloys of corresponding composition which have been brought to equilibrium before examination. MEH (5b)

The Crystal Structures of Electrodeposited Alloys. An X-Ray Diffraction Study of Silver-Cadmium Deposits. CHARLES W. STILLWELL & LAWRENCE E. STOUT. *Journal American Chemical Society,* Vol. 54, July 1932, pages 2583-2592.

Presented at the Buffalo meeting of the American Chemical Society, Sept. 1931. The most significant points brought out by this study are: 1. Every deposit consists of solid solutions or compounds. In no case is the deposit merely a mixture of Cd and Ag. 2. The phase stable in a given range of composition of the thermal alloys is the predominant phase in an electrodeposited alloy in that same composition range. 3. In general the deposits are heterogeneous, containing appreciable amounts of phases which do not exist in an annealed alloy of the composition in question. 4. There is little evidence indicating the formation of a metastable deposit under the conditions of the experiment. MEH (5b)

Hyperfine Structure of Lead. KIYOSHI MURAKAWA. *Scientific Papers Institute of Physical & Chemical Research,* Tokyo, Vol. 18, May 1932, pages 191-204.

Each line of the ordinary Pb spectrum consists of 2 lines of about the ratio 2:1 and fainter lines of ratios 2, 3 or 4. All observed hyperfine structure of the Pb spectrum can be interpreted by assigning the nuclear moments 0, ½. 0 to Pb_{208}, Pb_{207} and Pb_{206} respectively. The spectroscopic data give as the ratios of mixtures of ordinary Pb isotopes the values: $Pb_{208} : Pb_{207} : Pb_{206} = 47.7 : 25.9 : 26.4$. Ha (5b)

Studies upon the Widmanstätten Structure, I.—Introduction. The Aluminum-silver System and the Copper-silicon System. ROBERT F. MEHL & CHARLES S. BARRETT. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 78-122.

Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 908. (5b)

Radiological Methods of Testing Structures. V. E. PULLIN. *Steam Engineer,* Vol. 1, June 1932, pages 375-377. X-ray examination of metal products is discussed. AHE (5b)

An X-ray Examination of Iron-Chromium Alloys. G. D. PRESTON. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Ser. 7, Vol. 13, Feb. 1932, pages 419-425.

Scientific investigation for the accurate determination of the parameter changes which take place in the series of solid solutions. RHP (5b)

Hyperfine Structure of Mercury. V. KIYOSHI MURAKAWA. *Scientific Papers Institute of Physical and Chemical Research,* Tokyo, Vol. 18, May 1932, pages 177-190.

The hyperfine structure of Hg lines in the ultra-violet region is investigated. All lines are interpreted, without exception, by assuming the nuclear moments 0, ½, 3/2 for even isotopes, Hg_{199}, Hg_{201}, and by the intensity rules for the hyperfine structure multiplet. Ha (5b)

Utilization of the Radioactive Occurrences in Industry. III. Physical Investigations with Radium Rays. (Verwertung der radioaktiven Erscheinungen in der Technik. III. Physikalische Untersuchungen mit Radiumstrahlen.) H. W. FLEMMING. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, June 5, 1932, page 302.

Abstract of the following papers before the 37th annual meeting of the Deutschen Bunsengesellschaft. N. Riehl: Testing materials with γ-rays (with special reference to the testing of welds) K. Przybram: Radium rays as resource for the physico-chemical investigation of solid bodies. P. M. Wolf & N. Riehl; On the production of active deposit of thorium with high output. GN (5b)

X-Ray in the Aluminium Industry. N. C. HYPHER. *Metallurgia,* Vol. 6, Aug. 1932, pages 115-117.

Discusses usefulness of radiography in the Al alloy industry. Equipment and technique are described and several radiographs are shown. JLG (5b)

A Universal X-Ray Apparatus for Crystal Investigations. (Eine Universal-Röntgenapparatur für Kristalluntersuchungen.) H. BRAEKKEN. *Zeitschrift für Kristallographie,* Vol. 81, Feb. 1932, pages 309-313.

The outstanding features of a "universal" X-ray equipment are defined in the introduction. The essential part of the writer's apparatus is based on the goniometer of Weissenberg, improved by Böhm. The applicability and convenience has been greatly improved. The whole apparatus is built around a steel cylinder used as pre-vacuum container. The X-ray tube, a metal porcelain tube of the Siegbahn type, is on top of the pump. 3 different apparatuses can be mounted around the X-ray tube at the same time. The goniometer is provided with a removable optical device, thus representing a complete optical double circle goniometer. The axis carrying the mounted crystal can be revolved freely by an auxiliary screw. The rotation axis of the aperture system is perpendicular below the crystal. The main goniometer axis, the axis of the optical part, the axis of rotation and the axis of the aperture system intersect in the crystal. Thus photographs can be taken at different angles without changing the crystal's position. The film carrier is constructed in such a manner as to waste only a small angle range and to use films of various lengths. The translation ratio between the crystal rotation angle and the translation of the film can be adjusted to 3 values. A special plate carrier is employed for Laué photographs. Readjusting of the crystal is not necessary. EF (5b)

X-Ray Inspection of Welded Joints. H. R. ISENBURGER. *Steel,* Vol. 88, Apr. 30, 1931, pages 31-34, 38.

See "Radiographic Inspection of Materials," *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 62. Ha (5b)

Gamma Rays and their Uses. GILBERT E. DOAN. *Welding Engineer,* Vol. 17, Jan. 1932, pages 31-32.

The convenience of using radium as a source of γ rays for inspection of welds is explained and illustrated. Ha (5b)

Tables of Cubic Crystal Structure. I. E. KNAGGS, B. KARLIK & C. F. ELAM. Adam Hilger Ltd., London, 1932. Cloth, 6½ x 10 inches, 90 pages. Price 11s 6 d.

The aim of this book has been the collection of the available information, which has hitherto been scattered through the scientific journals of the world, in a convenient form. In each section the information is contained in the sets of tables of which the first gives the substances in alphabetical order, with their chemical formulae and index numbers in the succeeding tables and bibliography, the second gives the substances in order of lattice spacing and includes remarks, while the third is a full bibliography. It is of interest to note that the bibliography to the first section extends to more than 800 references and that to the second contains 126 references. A useful feature is the inclusion of several pages for notes in extension of the work.

This book should be of the greatest assistance to workers who practice X-ray methods of crystal analysis of powders and of separate crystals and should go far to encourage the extended use of X-ray methods for chemical analysis by releasing for general and ready use information whose scattered distribution has rendered it difficult of access. (5b)-B-

Constituents of Aluminum-iron-silicon Alloys. WILLIAM L. FINK & KENT R. VAN HORN. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 383-395.

Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 907. (5b)

Constitution of High-purity Aluminum-titanium Alloys. WILLIAM L. FINK, KENT R. VAN HORN & P. M. BUDGE. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 421-439.

Includes discussion. See *Metals & Alloys,* Vol. 2, May 1931, page 98. (5b)

The Structure of Extremely Thin Crystal Layers. (Über die Struktur extremdünner Kristallschichten.) F. KIRCHNER. *Die Naturwissenschaften,* Vol. 20, Feb. 12, 1932, pages 123-124.

Structural investigations by electron interferences were accomplished on crystal layers prepared by sublimation or evaporation in vacuum. Chaotic orientation is only met with in thin layers deposited on a glass carrier if the grain is exceedingly minute. A regular arrangement begins at a grain size of about 10^{-6} cm. Some experiments refer to depositions of metallic layers on celluloid, collodium and mica. The crystal arrangement parallel to the carrier fluctuated depending on the metal deposited and on the nature of the carrier. EF (5b)

The Structure Types of Steel on the Basis of Formation of the Atom Lattice or Grating. (Die Gefügeformen des Stahles, Gedeutet aus dem Bau des Atomgitters.) HEINRICH HANEMANN. *Archiv für das Eisenhüttenwesen,* Vol. 5, June 1932, pages 621-624.

From a crystallographic study of the transformation or conversion of the γ-solid solution in ferrite, pearlite, and cementite, as well as of the cementite crystallization in the formation of tertiary cementite according to the arrangement of the diffusing atoms in the space lattice, 3 separate classes of diffusion may be differentiated: (1) The perfusion, in which the migrating atoms are shifted or displaced to straight lines without displacing other kinds of atoms; (2) the concentric diffusion, in which atoms migrate with other classes of atoms to the nucleus positions of the new type of crystal through lattice pores and voids or position change; (3) the parallel diffusion, in which the direction movement of a large number of diffusing atoms is parallel or in line. The γ- and α- Fe are differentiated by the way in which the carbon migrates. In the γ-solid solution the carbon migrates by perfusion and at high velocity, while in α- Fe its motion is by diffusion with decreased velocity. Slices of steel samples, located in planes perpendicular to each other, having very large grained "Widmannstätten" structure were prepared and the inclination of the ferrite layers to each other was determined. It is evident that the ferrite of "Widmannstätten" structure principally forms layers in octahedral planes, only rarely in correlated cubic surfaces. Other directions of precipitation for ferrite were not encountered. DTR (5b)

X-Ray Radiography of Boilers with Special Reference to Welding Technique. (Die Röntgendurchstrahlung im Dampfkesselbetrieb unter besonderer Berücksichtigung der Schweisstechnik.) C. KANTNER & A. HERR. *Zeitschrift des Bayerischen Revisionsvereins,* Vol. 35, July 15, 1931, pages 149-152; July 31, 1931, pages 175-180; Aug. 15, 1931, pages 188-191; Aug. 31, 1931, pages 203-205.

The paper first outlines the principles of radiography as applied to boilers while in use. The largest part of the paper is given to the results of practical examinations as they were carried on by the Schweisstechnische Versuchsanstalt der Deutschen Reichsbahngesellschaft at Wittenberge. Fire boxes, boiler plates, various parts of boilers, boiler fittings and auxiliary equipment were examined. The apparatus used is described. The economy of radiography is discussed with special reference to the capacity and cost of operation. Radiography proved suitable for the X-ray examination of boilers. The safety in operation as well as the reliability in processing boilers and auxiliary equipment can be increased by X-raying so that accidents can be avoided by a careful continuous supervision. 18 references. GN (5b)

New Method of Testing Cast or Welded Pieces. (Nouveau procédé de controle des pieces coulées ou soudées.) HOLWECK. *L'Usine,* Vol. 41, June 3, 1932, page 31.

The principles of testing by X-rays, γ-rays, the properties of these radiations and the manner of their application are briefly explained. Ha (5b)

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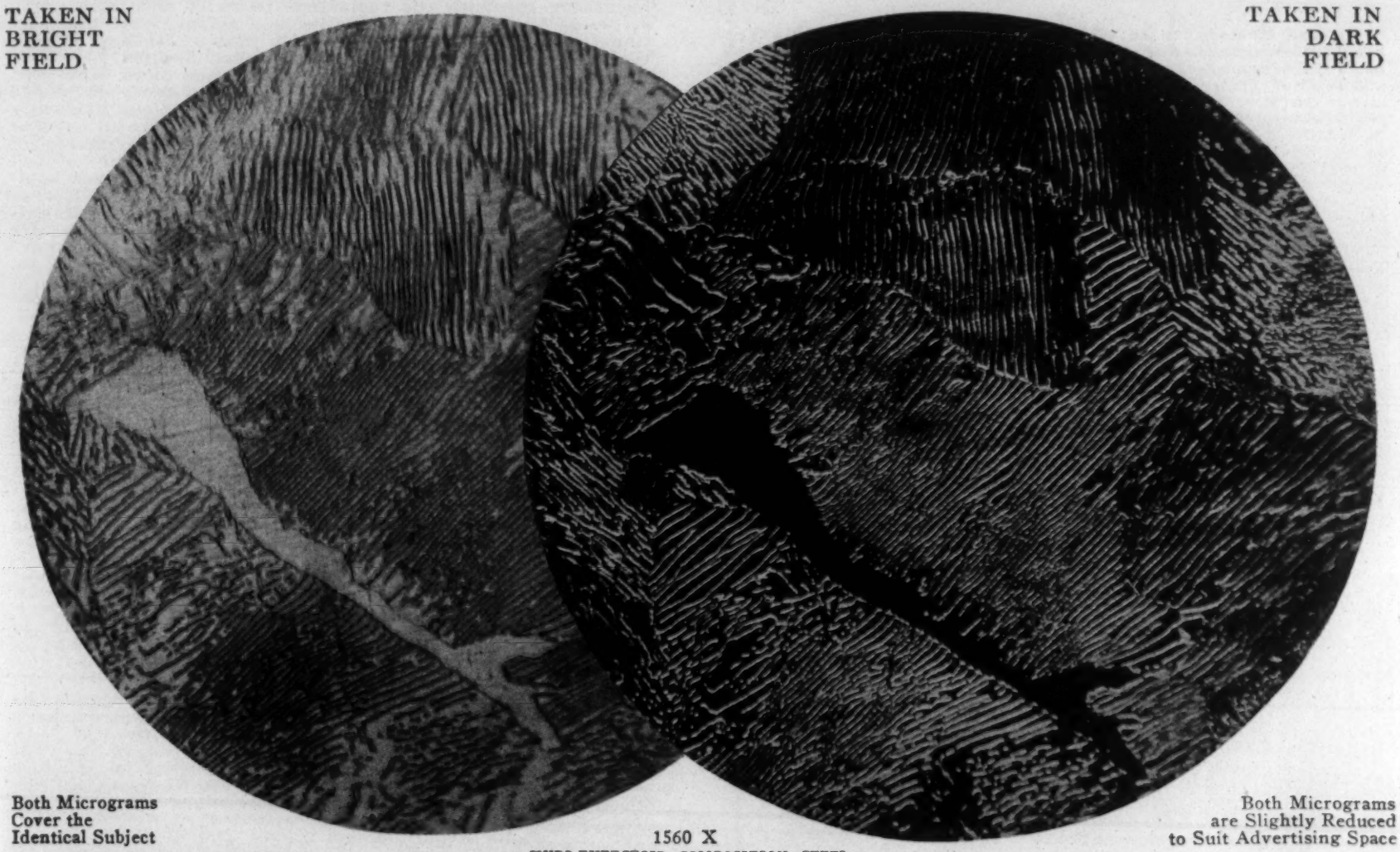

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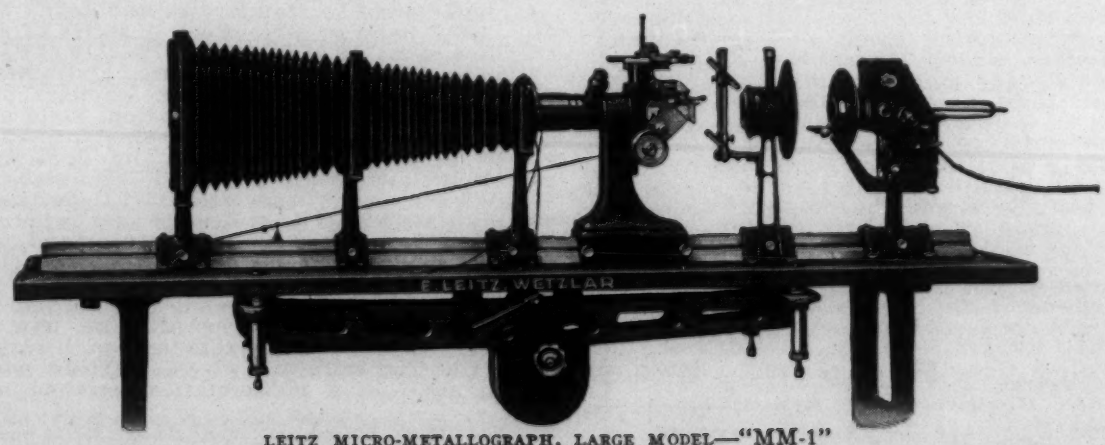

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PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

Technical Methods of Photo-elastic Research. (Technische Methoden photoelastischer Forschung.) R. V. BAUD. *Schweizerische Bauzeitung,* Vol. 100, July 2, 1932, pages 1-3; July 9, 1932, pages 15-20.

The paper discusses the technical side of photo-elastic research with special reference to simple and rapid methods. A historical survey is given first on the photo-elastic methods developed so far and their possibilities of application. Those discussed at length are (1) the method of the sensitive color, (2) the photographic method, (3) the Coker compensation method. Some examples on the fields of principal stresses are considered. The more complicated methods of directly determining the principal stresses are also discussed. 26 references. GN (6)

On the Resistance to wear of Rail Heads. (Ueber die Verschliessfestigkeit der Schienenköpfe.) *Stahlbautechnik,* Supplement to *Montanistische Rundschau,* Vol. 24, June 16, 1932, page 8.

Abstract from a report of the Vienna Municipal Testing Laboratory. *(Mitteilungen der Wiener Städtischen Prüfungsanstalt für Baustoffe,* Report 1, 1932). The paper deals with the increase of the wear resistance of rail heads of sorbitic structure, describes the various types of testing machines (Spindel, Amsler, Mohr and Federhaff) and discusses experiences with sorbitic rails in various countries. The importance of the chemical composition and a sufficiently high yield point is pointed out. GN (6)

The Torsion Problem of the Eccentric Circular Ring. (Das Torsionsproblem für den Exzentrischen Kreisring.) E. WEINEL. *Ingenieurarchiv,* Vol. 3, Mar. 1932, pages 67-75.

For the eccentric circular tube which is subjected to torsion, the torsion functions, the drilling moment and the maximum shear stresses have been determined and are discussed in accordance with the methods as they have been used by A. Föppl and L. Föppl. It is shown that the formulae on the maximal shear stress given by Macdonald (Torsional strength of a hollow shaft, *Proceedings Cambridge Philosophical Society,* Vol. 8, 1893, page 62) do not hold true. The formulae have been revised, numerical results are given. 4 references. GN (6)

On the Relation between Stresses and Deformation in the Work Hardening Range. (Ueber den Zusammenhang von Spannungen und Formänderungen im Verfestigungsgebiet.) R. SCHMIDT. *Ingenieurarchiv,* Vol. 3, June 1932, pages 215-235.

This is an extensive experimental investigation on the laws of plastic deformation carried out at the Institute for Applied Mechanics of the University of Göttingen. A specially built Losenhausen tension-torsion machine was used which permits the study of the flow of metal under the simultaneous influence of tension and torsion. The deformation was measured with a specially designed apparatus for simultaneous measurement of torsion and elongation. Low C steel tubes and Cu tubes of small wall thickness were tested in order to guarantee a homogeneous state of stress. The tests comprise (1) Combined tension-torsion flow tests without intermittent load lifting on steel tubes. (2) Alternating tension-torsion tests with intermittent load lifting. (3) Pulling tests on light low C steel plates, alternating in longitudinal and transverse direction. (4) Torsion tests on steel tubes with alternating direction of torsion. 8 references. GN (6)

Wear Tests on Automobile Gears. (Verschleissversuche mit Zahnrädern für Kraftwagen.) RIST. *Zeitschrift des bayerischen Revisionsvereins,* Vol. 36, Aug. 15, 1932, pages 177-178.

Abstract of paper by M. Ulrich in *Mitteilungen aus der Materialprüfungsanstalt der Technischen Hochschule Stuttgart,* Report No. 4, 1932, 95 pages. The tests comprised: (1) running tests on single gears with stable bearings and increasing the gear load by steps. Alloyed and unalloyed case carburizing steels of German, Austrian, Czecho-Slovakian and American make were used. (2) Running tests on complete automobile gear sets of German and foreign heat treated steels. (3) Cyanided single gears of German, Austrian and American heat treated steels tested as under (1). (4) The same steels as under (3) tested as group (2). (5) Shifting tests on alloyed case-carburizing steels, heat treated steels and cyanided heat treated steels. The wear was tested by 3 methods, by means of an optical gage, by determining the total weight loss. The results show that the corresponding steels of various manufacturers are quite similar. Group (1) showed the best results. Heat treated steels wear more. Cyanided heat treated steels show less wear than non-cyanided steels. This is shown on single gears as well as whole gear sets. As to the wear of gears in violent shifting it was found that the wear of case-carburizing steels is in part somewhat higher than that of cyanided and non-cyanided heat treated steels. For chemical composition, heat treatment, mechanical properties of the steels and gears used in the tests and the detailed results the original paper must be referred to. GN (6)

The Question of Stress in the Repeated Impact Test. (Zur Frage der Beanspruchung beim Dauerschlagversuch.) A. THUM & S. BERG. *Mitteilungen der deutschen Materialprüfungsanstalten,* No. 12, 1932, pages 180-182.

See *Metals & Alloys,* Vol. 1, Oct. 1930, page 796. HWG (6)

The Relation between Rockwell and Brinell Hardness. *Metallurgist,* July 1931, pages 110-111.

An extended abstract of a paper by A. Wallichs & H. Schallbroch. See "The Relation Between Different Hardness Numbers of Cast Iron and Chill Castings," *Metals & Alloys,* Vol. 3, June 1932, page MA 160. VVK (6)

Testing of Automobile Steels. (Die Prüfung von Automobilstählen.) *Stahlbautechnik,* Supplement to *Montanistische Rundschau,* Vol. 24, Aug. 16, 1932, page 8.

Abstract of a paper in *Mitteilungen der Städtischen Prüfungsanstalt des Wiener Magistrates.* The importance of the notched impact test is emphasized. Dynamic tensile tests are also of importance in testing automobile steels. GN (6)

Theoretical and Experimental Investigations on the Torsion of Box Sections. (Theoretische und experimentelle Untersuchungen zur Torsion von Kastenquerschnitten.) S. VON BOUTEVILLE. *Forschung, Zeitschrift Technische Mechanik und Thermodynamik,* Vol. 3, Jan./Feb. 1932, pages 25-42.

After some introductory remarks on the use of box sections, previous solutions on the determination of the torsion of loaded box sections are discussed. A new approximate method is developed for the calculation of the torsional stresses in thick-walled box sections. The method can also be applied to other hollow sections. In the method the box is subdivided in single plates the deformations and stresses of which are investigated. The solution, in comparison with the most frequently applied approximate solution for thin-walled box sections shows that an additional correction is necessary for both the resistance to twist and the torsion stresses. Measurements on 5 various symmetrical box sections of annealed cast steel confirm that the theory holding true for thin-walled box sections when applied to thick-walled box sections gives errors of 30% and more. However, the deviation of the testing results from the newly developed approximate theory on thick-walled box sections generally does not exceed 10%. The formulae developed are to be used also for unsymmetrical box sections, double-symmetrical box sections, and square-shaped box sections. The method of investigation is applicable to other hollow shapes composed of rectangular sections. 15 references. GN (6)

Dependence of the Damping of materials upon the Magnitude and Speed of Deformation. (Die Abhängigkeit der Werkstoffdämpfung von der Grösse und Geschwindigkeit der Formänderung.) E. BANKWITZ. *Mitteilungen des Wöhler-Instituts,* Heft 11, 1932, 53 pages.

Torsional damping tests, which included rise of temperature determinations, were made on 3 low and medium C steels, on Cu, commercial Al alloys, a cast brass of unstated composition, 2 Al alloys and elektron. Some of these materials have endurance limits above the static yield point, and on account of thermal conductivity, thermal measurements of damping at low deformations are difficult. The experiments were aimed to produce data on the first part of the damping curve. The results are expressed in formulae, tables and curves which do not lend themselves to abstracting. Bankwitz believes that he has smoothed out some of the discrepancies of earlier work. HWG (6)

Vibrations in Freely-swinging Wires and their Damping. (Schwingungen an Freileitungsseilen und ihre Dämpfung durch Resonanzschwingungsdämpfer.) F. PURITZ. *Mitteilungen des Wöhler-Instituts,* Heft 12, 1932, 67 pages.

Resonance in conductor wires, and in the system-conductor and pole or mast was studied experimentally on a small scale and the results applied to large scale work. Rubber damping devices, spring suspensions of both steel and Cu and various methods of suspending the cable from the mast were studied. Suitable damping devices cut down the amplitude of vibration very markedly. HWG (6)

On the Elastic Extension of Metal Wires under Longitudinal Stress.—Part 2. Experimental. L. C. TYTE. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Ser. 7, Vol. 13, Jan. 1932, pages 49-69.

An extended research to measure deviations from Hooke's law. Materials investigated were steel, Fe, Ni, brass, Cu, Al, Zn, Sn and Pb, some of them being examined after different heat treatments. All metals investigated showed deviation over the whole experimented range. The deviation differs widely for different materials and for the same materials with different treatments. For annealed metals the deviation increases with increase of crystal size. RHP (6)

Basis for the Testing and Grading of Rolling Hardness of Cold Rolled Low Carbon Strip Steel. (Unterlagen für die Prüfung und Walz Härtenstaffelung von Kaltgewalztem Kohlenstoffarmen Band Stahl.) ANTON POMP & FRITZ WINTERHOFF. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, Report 197, 1932, pages 11-24.

For a long time it has been customary to assign terms to the various degrees of hardness of cold rolled material. The German method of designating amount of hardness generally could be classified in 6 different ranges, running from dead annealed to completely hard. The individual ranges were wide and not definitely limited, one hardness range almost always overlapping other ranges. This present study was undertaken to standardize and define hardness in cold rolled low-C band or strip steel. A series of strip samples, analysis of 0.12% C, 0.55% Mn, 0.017% P, 0.019% S, trace Si, in thicknesses of 1.5, 1, and 0.5 mm., and annealed at 670° and 920° C. were given increasing amounts of cold roll reduction from 0 to 75%. The elongation, yield point, tensile strength, hardness, penetration and structure examination were made of original, intermediate and final material. The original strip sheets were produced from slabs 40 mm. thick, heated in a semi-gas furnace to 1250° C., broken down and hot rolled on a strip mill to strips 130 mm. wide and 4 mm. thick. Tensile strength test made in center and on 2 sides in an Amsler test machine; hardness by Rockwell (B) 1/16" steel ball 100 kg. load; bend test by Tarnogrocki, forward and backward bends of 180° = 1 bend; penetration by both Erichsen and Guillens methods. The old and new methods of defining amount of hardness together with ranges of physical properties for each are given, starting with annealed material. In addition a mathematical method is given by following equation based on test data: $h_0 = \frac{h_1}{1 - \frac{w}{100}}$, where h_0 is the required thickness of original strip sheet after annealing subsequent to hot rolling, h_1 is finished strip thickness desired, w is % reduction in thickness or necessary amount of cold roll reduction. A complete chart was made from the equation for every range of hardness and it is possible to pick out original strip sheet thickness to produce any range of hardness for any desired finished gage strip steel. The applications of each of the 8 ranges of hardness are explained as to the use intended for the material. DTR (6)

Fatigue of Metals & Alloys (6f)

The abstracts appearing under this heading are prepared in coöperation with the A.S.T.M. Research Committee on Fatigue of Metals.

The Elastic Limit of Metals. (La Limite Elastique des Metaux.) PIERRE VERNOTTE. *Chimie et Industrie,* Vol. 27, Apr. 1932, pages 765-769.

The author considers the methods used in Germany for determining the fatigue limit by short-time methods are unsatisfactory. One method, based on the heat effect under rotary bending, did not show satisfactory results. Another, based on change in rate of deflection, seems to be based on phenomena not related to fatigue and results in an early generalization of now doubtful experiments. The author distinguishes between deformation resulting from variations in physico-chemical structures and deformation resulting from purely mechanical effects, e.g.: (1) Irreversible, non-permanent deformation, dependent on variations in the structure, which in turn are dependent on the stress-cycle, but show a time lag; it initiates with the slightest stress-cycle. (2) Eventual, irreversible, permanent deformation, dependent on variations in structure, effected generally with a certain time lag, but irreversibly dependent on the stress-cycle; it initiates when this cycle reaches a certain degree. (3) Irreversible, permanent deformation, almost instantaneous, but originating from purely mechanical causes, starting at a generally higher value in the stress-cycle. Deformation of metals, then, to a great extent depends on the law of applied force versus time, but the true elastic limit would not depend on it. It would be difficult to distinguish experimentally between these 2 limits: the limit of permanent reactivity and the true elastic limit. In numerous simple cases, particularly if the structure is sufficiently homogeneous, the fatigue limit should be identical with the true elastic limit. The author discusses the theory of fatigue at high temperatures. MAB (6f)

Fatigue Strength and Strain Relief. CHAS. H. JENNINGS. *Welding Engineer,* Vol. 17, Feb. 1932, pages 39-41, 58; Mar. 1932, pages 38-39.

Data on the properties of welds and welded joints are given derived from tests which make possible finding a scientific basis for the design of welded structures. See "The Relief of Welding Strains by Annealing," *Metals & Alloys,* Vol. 2, Dec. 1931, page 310. Ha (6f)

Corrosion-Fatigue. *Metallurgist,* Jan. 1932, pages 11-13.

Extended abstract of paper by Inglis and Lake in Transactions Faraday Society, Vol. 27, Dec. 1931, on "Corrosion-fatigue Tests of Mild Steel and Chromium-nickel Austenitic Steel in River Tees Water." See *Metals & Alloys,* Vol. 3, May 1932, page MA 128. VVK (6f)

The Practical Application of the Microscope in Railway Service. FREDERICK H. WILLIAMS. *Engineering Journal,* Vol. 14, Nov. 1931, pages 558-563; discussion Dec. 1931, page 608.

Microscopic examination of the material involved in the fracture of machine and structural parts has been found of very great value, and this paper gives illustrations of a number of typical failures, principally in locomotive work, and discusses their probable causes, with special reference to the occurrence of failure from fatigue cracks. VVK (6f)

The Endurance Impact-Bending Test. (Der Dauerschlagbiegeversuch.) M. BEILHACK. *Forschung auf dem Gebiete des Ingenieurwesens,* No. 354, Section B, Vol. 3, May-June, 1932, pages 1-22.

The endurance impact-bending test is an impact test made on notched rods in which the material to be tested is stressed and examined not in the range of the plastic deformation as is the case in the notch-impact test; it can be called a dynamic fatigue test. The apparatus and machines for this test are described and results of tests of the dependence of number of impacts on weight and height of impact discussed. Oscillographic curves were taken to determine the vibrations occurring during an impact and formulas are developed for the numerical calculation of the diagram time-path for the elastic impact with and without losses. It is pointed out that in order to properly judge a material by this fatigue test not only the energy of the impact and the number of impacts leading to fracture, but also the weight and the height of the falling weight be given. The deflection during the test should also be given as from it the magnitude of the stresses in the sample can be approximately calculated. The individual tests are reproduced in full and illustrated by micrographs. 8 references. Ha (6f)

Nickel Tubing Resists Fatigue. R. WORTHINGTON. *Inco,* Vol. 11, No. 2, 1932, pages 11, 29.

See *Metals & Alloys,* Vol. 3, June 1932, page MA 169. Ha (6f)

Endurance Corrosion Tests on Condenser Tubes in Operation. (Dauerversuche über die Korrosionen von Kondensatorrohren im Betrieb.) P. REUTER. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Apr. 1932, page 109.

The corrosion tests comprised condenser tubes of 4 marine alloys, a 70% brass without Sn, a 98.5% Cu alloy (1.5 Sn), a 97% Cu-3% Al bronze, a 85% Cu-15% Ni alloy. Contrary to general experience it was found that all of the alloys with coarse grain were much more resistant against corrosion than the fine grained. GN (6f)

Cadmium Plating vs. Corrosion-fatigue, Pickling vs. Corrosion-fatigue. WILBER E. HARVEY. *Metals & Alloys,* Vol. 3, Mar. 1932, pages 69-72.

4 references. Fatigue values when the parts are exposed to corrosion by water are very greatly decreased and even the highest strength steels have values of less than 25,000 lbs./in.^{2} under such conditions. The experiments reported by the author show that Cd and Zn coatings are very effective in protecting against corrosion fatigue. H_2 absorbed in pickling operations preparatory to plating has a very deleterious effect upon the corrosion fatigue value of the plated material. Use of organic compounds in connection with the cleaning aids in avoiding the embrittlement due to H_2. WLC (6f)

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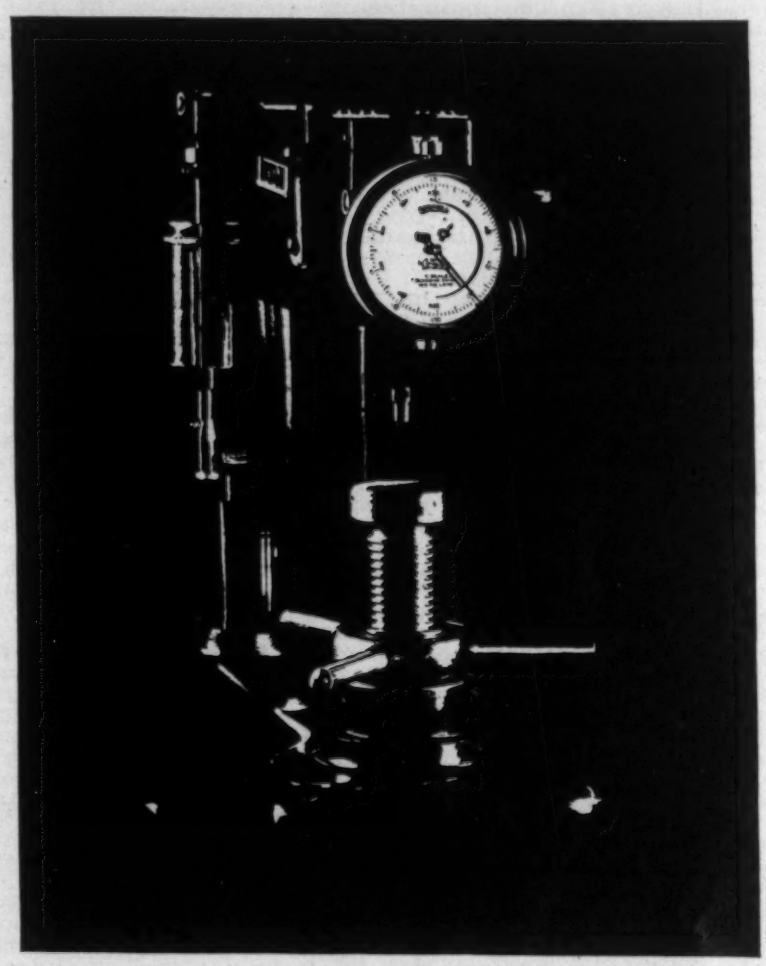

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Endurance Strength of Screws. (Dauerfestigkeit von Schrauben.) W. STAEDEL. *Forschung (Zeitschrift Technische Mechanik und Thermodynamik)*, Vol. 3, Mar.-Apr. 1932, pages 106-108.

The endurance strength of screw connections in relation to the thread tolerance were made with a specially designed endurance machine. 6 references. GN (6f)

General Statements about Fatigue Fractures on Electrically driven Shafts. (Allgemeines über Schwingungsbrüche bei elektrischem Antrieb.) W. REINECKE. *Maschinenbau*, Vol. 11, July 7, 1932, pages 272-273.

One of a series of articles dealing with problems of fatigue fractures. Errors in fabrication, inspection and mounting are discussed. Mechanically and electrically driven shafts are compared. RFV (6f)

Endurance Tests with Riveted Joints. (Dauerversuche mit Nietverbindungen.) K. SCHAECHTERLE. *Stahlbau*, Supplement to *Bautechnik*, Vol. 10, Apr. 24, 1932, pages 65-72.

The static and dynamic properties of joints with 1, 2, 3 and 4 rows of rivets were tested. The maximum breaking loads in the endurance tests are up to 57% below the static breaking loads. The main results are given in the following table:

Type of joint	Maximum breaking load static tensile test kg./cm.²	Maximum breaking load endurance test kg./cm.²	Ratio endurance load to static breaking load
1 row	31,000	19,400	.63
2 rows	63,750	34,000	.53
3 rows	83,150	35,800	.43
4 rows	.....	39,100	..

Whereas in the static test of the 1-row rivet joint the rivet was sheared off; in the 2-row joint, the rivets were sheared off and the plates simultaneously torn. In the 3-row joint the plates were torn in the cross-sections of the outside rivet rows. In the fatigue tests all samples show the characteristic fatigue fracture. From the fatigue loads the normal and shear stresses in the rivets were determined. The 2-row joint shows a relatively high fatigue strength. The fatigue strength decreases rather continually with increasing pressure in the rivet hole. When the pressure in the wall of the rivet hole exceeds a certain limit the fatigue strength decreases suddenly. 3 references. GN (6f)

The Rivet Joint. New Knowledge From Endurance Tests. (Die Nietverbindung. Neue Erkenntnisse aus Dauerversuchen.) K. SCHAECHTERLE. *Bautechnik*, Vol. 10, May 20, 1932, pages 275-278; May 27, 1932, pages 290-294.

The first part of the paper is given to an analysis of the stresses in rivet joints. Yield point, tensile strength, elongation and reduction of area of the steel plate to be used in the joints, and the static and endurance properties of joints in a Schenck endurance testing machine were determined. The results of fatigue tests on low carbon steel plate are in accord with practical experiences. It is shown that the fatigue properties of steel plate as well as rivet are satisfactorily utilized in the common methods for calculating and dimensioning riveted joints. In riveted steel constructions calculated and dimensioned according to the German specifications (D I N 1073) the safety factor against fatigue failure amounts to about 1.4-1.5. For normal constructions the present method of calculation suffices. In special cases it is possible to increase the stresses endured close to the fatigue limit. In using steels with higher tensile strength and yield point it is possible by properly dimensioning and making the joint to fully utilize the fatigue limit as determined on the bored plate with rolling skin. The paper finally points out that in order to obtain reliable data on the calculation of riveted joints the common static tensile tests should be supplemented by fatigue tests. As a yardstick for the suitability of a certain structural steel (sensitivity to notch effects, effect of the surface condition, effect of the holes in the riveted construction) the fatigue limit as determined on standard flat bars of plates with rolling skin and provided with rivet holes should be used. 15 references. GN (6f)

Vibration and Fatigue in Electrical Conductors. A. E. DAVISON, J. A. INGLES & V. M. MARTINOFF. *Electrical Engineering*, Vol. 51, June 1932, pages 412-413.

A discussion of vibration in electrical conductors leads the author to the necessity for the development of some new types of conductor which must have either some other shape or other inherent qualities in order to withstand better the tendency to vibrate and to fail because of resulting fatigue than the standard sections now used. Ha (6f)

Endurance Strength Tests with Welded Girders. (Dauerfestigkeitsversuche mit geschweissten Trägern.) R. HOCHHEIM. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns*, Vol. 1, Mar. 1932, pages 225-227.

2 girders welded together of flats in double-T shape with reinforcing ribs and the seams running throughout the length of the girder were subjected to an alternating load between 24,000 and 8,000 kg./mm.²; after 2,160,900 changes of load the girder was still fully intact. It could be stated that girders welded over the whole length (not in places only) are insensitive to static stresses even above the range of the elastic limit; this means that this manner of welding presents the best utilization of the material of composite sections. Ha (6f)

Endurance Tests with Welded Joints. (Dauerversuche mit Schweissverbindungen.) O. GRAF. *Bautechnik*, Vol. 10, July 22, 1932, pages 414-417.

The principal results of the investigation are: (1) Gas welded joints showed higher endurance strength than electrically welded joints. (2) Butt welded joints showed higher endurance strength than certain lap welded joints made according to German specifications. (3) The length of the lap weld has a considerable bearing on the endurance strength even when the fracture does not occur within the seam but at the beginning of the joint. (4) In the lap welded joints fracture always occurred in the beginning of the joint. (5) All of the results prove that proper design of the welded joint, selection of the welding rod and subsequent treatment of the joint afford increased attention, when joints are concerned that are subjected to alternating loads. GN (6f)

ELECTRO-CHEMISTRY (7)

Electrometallurgy. (Allgemeine und technische Elektrometallurgie.) ROBERT MÜLLER. Julius Springer, Vienna, 1932. Cloth, 6¼x9¼ inches, 580 pages. Price 32.50 RM.

The chemistry and electrochemistry of the deposition of the metallic elements, from aqueous solutions or from fused salts, as the case may be, are thoroughly discussed in this comprehensive text book. Electrolytic refining and electroplating are described as special cases in connection with each element, the conditions used being led up to after discussion of its electrochemical behavior. Many current density-potential curves are given.

Some sketches of commercial cells are shown, but the volume deals more with principles than with commercial practice. Suitable plating baths are given, but it is far from a mere book of recipes.

Thousands of references to the literature are included, the selection being aimed at completeness. Many very old references are given including a good many references to patent literature, of doubtful value from the technical point of view. The book is well printed, well bound and well indexed. It deals only with electrolysis, not with electrothermics.

It is a valuable reference book. H. W. Gillett (7)-B-

The Handling of Cyanide Baths in Electroplating. (Über die Behandlung cyankalischer Bäder in der Galvanotechnik.) K. HÜTTENES. *Metallwaren Industrie und Galvanotechnik*, Vol. 29, Feb. 1, 1931, pages 55-56.

Discusses the removal of excess K_2CO_3 or Na_2CO_3 from cyanide baths by a freezing out process. Anodic slimes in brass baths are often caused by NH_4Cl which should be replaced by NH_4OH. EF (7)

Electroplating (7a)

Electrodeposition of Chromium-Iron Alloy. G. FUSEYA & K. SASAKI. *Transactions Electrochemical Society*, Vol. 59, 1931, pages 445-460.

Includes discussion. See *Metals & Alloys*, Vol. 2, Sept. 1931, page 174. (7a)

Further Developments in Low pH Nickel Deposition. W. M. PHILLIPS. *Transactions Electrochemical Society*, Vol. 59, 1931, pages 393-396.

Includes discussion. See *Metals & Alloys*, Vol. 2, Sept. 1931, page 174. (7a)

Chrome Plating of Light Metals, in particular of Aluminum and Aluminum Alloys. (Verchromung von Leichtmetallen, besonders von Aluminium und Aluminiumlegierungen.) GEO. BUCHNER. *Oberflächentechnik*, Vol. 9, June 7, 1932, page 113.

While a thickness of 0.001 mm. Cr on Cu plated or Ni plated objects gives a very good protection against atmospheric influences, a thicker Cr layer hardens the surface in such a manner that the life of the article is greatly lengthened. This is especially true of dies. Only HCl has a harmful influence on Cr. For this reason, Cr plating is a good field for surface-hardening of light metals. It is very important to keep temperature and current density in proper limits. Articles of Al alloys can be Cr plated directly, without any intermediary layer. The methods of Cr plating are briefly described. Ha (7a)

The Electro-Deposition of Alloys. L. B. HUNT. *Metallurgist*, Apr. 1932, pages 52-53; May 1932, pages 66-68.

A review of 31 references. VVK (7a)

Galvanic Protective Coats and their Application in the Wire and Cable Industry. (Galvanische Schutzüberzüge und ihre Anwendung in der Draht- und Kabelindustrie.) E. BERTL. *Elektrotechnische Zeitschrift*, Vol. 53, June 16, 1932, page 579.

A fully reliable protection against corrosion of wires is obtained electrolytically only from deposits of bivalent metal ions of Sn and Pb which alone guarantee a complete denseness and uniformity; baths containing bivalent and 4-valent ions or only 4-valent ions do not produce a properly adhering coating; it can be wiped off. A thickness of 0.009 mm. Pb suffices for corrosion protection if no mechanical stresses are present. In practice, 0.3 mm. is customary. This corresponds to 3.33 kg./m.² Wires with rubber insulation need only 0.1-0.15 mm. or 0.72-1.08 kg./m.² The electrolytic plating process is considered superior to the thermal processes. Ha (7a)

The Electrodeposition of Chromium and the Influence of the Cathode Metal. J. W. CUTHBERTSON. *Transactions Electrochemical Society*, Vol. 59, 1931, pages 401-428.

Includes discussion. See *Metals & Alloys*, Vol. 2, Sept. 1931, page 174. (7a)

Some Aspects of Throwing Power, Its Quantitative Expression. S. FIELD. *Preprint, Electroplaters' & Depositors' Technical Society*, London, Jan. 1932, pages 83-90.

New expressions of positive and negative throwing power are suggested on the basis of measuring it at a fixed distance ratio of 2. For positive throwing power, T.P. = 100 (D.R. - M.R.); for negative throwing power, T.P. = -100 $\left(D.R. - \frac{A}{A-C}\right)$; where D.R. = Distance ratio, M.R. = Metal ratio, A = Weight of deposit on near plate, and C = Weight of deposit on distant plate. Apparatus for measuring throwing power was proposed in which 2 sections of the cathode are placed on the same side of the anode, one twice as distant from the anode as the other. For baths having nearly constant cathode efficiency with respect to current density, a set of ammeters are used instead of weighing the cathode plates, thus making the throwing power measurement a matter of few seconds. LCP (7a)

Report on the Preparation of Specimens for Exposure Tests of Electroplated Coatings on Steel. By Joint Committee of American Electroplaters Society, American Society of Testing Materials and the Bureau of Standards. *Monthly Review, American Electroplaters Society*, Vol. 19, May 1932, pages 6-15.

General plan, cleaning procedures, plating bath compositions, thicknesses of deposit and conditions of plating are given in detail. Plating baths listed include Ni, Cr, Cu, Zn, Cd and Cd-Zn alloy. LCP (7a)

Electrolytic Rhodium, Platinum and Palladium Deposits. (Elektrolytische Rhodium, Platin und Palladium Niederschläge.) P. Hass. *Deutsche Goldschmiedezeitung,* Vol. 35, July 16, 1932, pages 296-297.

Description of the Pt, Rh and Pd baths developed by the W. C. Heraeus Co., Hanau, for electroplating. Electroplating with Pt metals is particularly to be used for plating Ag and Ag alloys, white gold and a large number of base metals. The Rh bath is preferred to Pt and Pd baths since it affects the bright white color of Ag only slightly. Rh is harder and more resistive than Pt and Pd. A corrosion resisting Rh plating may be obtained in 2-3 minutes. The Pt and Pd baths of the Heraeus Co. also furnish bright corrosion resisting deposits. GN (7a)

High Speed Nickel Plating as Practiced in England. Ernest R. Canning. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 371-377.

Includes discussion. See *Metals & Alloys,* Vol. 2, July 1931, page 130. (7a)

The Finishing of Brass Stampings for Automotive Hardware. Allen W. Carter. *Monthly Review, American Electroplaters Society,* Vol. 19, July 1932, pages 17-19.

Operating details of a typical modern Ni and Cr plating plant for brass articles. LCP (7a)

The Action of Certain Organic Compounds during the Electrolytic Deposition of Zinc. (L'azione di alcune sostanze organiche nella deposizione elettrolitica dello zinco.) L. Cambi & G. Devoto. *Atti della Reale Accademia Nazionale dei Lincei,* Vol. 15, Jan. 3, 1932, pages 27-29.

By polarographic studies, it is shown that pyridine and its basic substituted derivatives increase the efficiency of Zn deposition from basic solutions to 80-90%, compared to the usual 70%. This is due to a reduction of the deposition potential of Zn and not to a reduction in H overvoltage, the reduction amounting to 0.1 v with 0.1 Molal $ZnSO_4$, and 0.25 v for a similar $NiSO_4$ solution. The action of pyridine and its derivatives is specific, as piperidine has no such action. In practice, 100 g. of pyridine are consumed per 1000 kg. of cathode product. Its use makes it unnecessary to remove traces of impurities, such as Ni or Co. AWC (7a)

A Study of Silver Plating Solutions. B. Egeberg & N. Promisel. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 287-306.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

The Limiting Current Density in the Electrodeposition of Noble Metals. S. Glasstone. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 277-285.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Nickel-Chromium. (Nickelchrom.) H. Hornauer. *Emailletechnische Monatsblätter,* Apr. 1932, pages 27-28.

Easy rusting and scaling of Cr plated articles is due to a faulty base plating of Ni. The Ni plating must be free of pores, tightly sticking and poor in H. In degreasing the article before Ni plating and Cr plating only well tried degreasing baths should be used. For Fe and steel parts electrolytic Cu baths are most adaptable. In such baths the parts first receive a thin coating of Cu before subsequent plating. For subsequent Ni plating the use of the rapid Ni plating bath "Auto-Rapid" is suggested. In plating the bath is heated to about 35° to 40° C. GN (7a)

The Electrodeposition of Tungsten from Aqueous Solutions. Colin G. Fink & Frank L. Jones. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 461-481.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Commercial Rhodium Plating. Lionel Cinamon. *Brass World,* Vol. 28, May 1932, page 97.

A comparison is made of the sulphate and phosphate baths. Advantages of the former are a more rapid plate, lower plating voltage (4-6 v.), and greater ease in manufacture of the salt, and the smaller anode area required. Rh cannot be plated directly upon Pb, Sn, Sb, Cd, Cr, Fe, stainless steel, or alloys such as white metal, die casting metal, brass, etc. Direct plating is possible on Au, high-karat Au, Cu, Ag, Ni silver, Pt, Pd, etc. WHB (7a)

Some Production Methods Used in Chromium Plating. B. G. Daw. *Monthly Review, American Electroplaters Society,* Vol. 19, June 1932, pages 23-27.

3 variations in the details of Cr plating are given: (1) First at 2 volts below normal, then at normal voltage, articles introduced dry into the bath. (2) Articles first cleaned in electrolytic alkaline cleaner, rinsed with HCl and introduced into the Cr plating bath at normal or higher than normal voltage. (3) Articles cleaned as in (2) and introduced into Cr plating bath with current on through a flexible cable. LCP (7a)

Bright Silver Plating from the Cyanide Bath. L. C. Pan. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 329-335.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Progress in the Electroplating Industry (1931). E. A. Ollard. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 105-107.

The mechanization of the plating shop degreasing with trichlorethylene, and the plating of Pt group metals are among the new developments. PRK (7a)

Some Chemical Aspects of the Electroplating Industry. E. E. Halls. *Chemical Age,* London, Vol. 26, Apr. 23, 1932, pages 372-373.

Factors having a considerable influence on electroplating are impurity of metal anodes, cleaning and degreasing of work, uniform contents of bath ingredients and uniformity of current density. VVK (7a)

Studies on Silver Baths and Means to avoid the Tarnishing of Silver. (Studien über Silberbäder und Massnahmen gegen das Anlaufen des Silbers.) Walter Obst. *Deutsche Goldschmiedezeitung,* Vol. 35, June 4, 1932, pages 229-231.

The paper especially refers to some methods used for avoiding the tarnishing of Ag electrodeposits. GN (7a)

Electrometallurgy (7b)

The Removal of Bismuth in Lead by Means of Calcium. (Die Entwismutisierung von Blei mittels Kalzium.) *Die Metallbörse,* Vol. 22, Apr. 9, 1932, pages 450-451.

The electrolysis of raw Pb only works economically if the Bi content does not drop below 1%. While low Bi contents are usually not objectionable in Pb alloys, Bi must be removed in Pb used for certain chemical purposes. (0.05% max.) Experiments of Kroll yielded that Bi can be concentrated in dross by adding alkalies or earth alkalies to the lead bullion. According to his American Patent, 0.2% Bi in raw lead is reduced to 0.05% by Ca, while the concentration in the dross is as high as 5%. However As, Sb, Ag and Cu are also practically completely extracted. The low Ca content remaining in the Pb bath is removed by a chloridizing treatment or by steam. Experiments along the same line by R. F. Cohn, Columbia University, and at the University of Michigan confirmed earlier results. With regard to the economy, about the same quantity of Ca is required for 0.1% Bi. The economy increases up to 0.5% Bi. Four paramount points on which the economy of the Ca extraction process is based are given in conclusion. EF (7b)

The Action of Cyanide on Gold. G. O. Ramsay. *Chemical Engineering & Mining Review,* Vol. 24, Apr. 5, 1932, pages 236-237.

Various chemical equations representing the reactions between Au and KCN are shown and the possibility of the formation of H determined by means of a potentiometer, calomel cell, and a Au electrode. A distinct rise in potential difference is noted, which is most marked in the first 4 minutes. Passage of O over the Au electrode after 36 minutes' immersion caused an immediate drop in potential from .892 to .630 v. "If the measure of solubility of Au may be determined by the difference between its present potential difference and some definite figure such as is with this cell, .950 v., then it can be seen that any depressant such as O would not be without value to the cyanide process." WHB (7b)

On the Effect of Colloids on Technical Zinc Electrolysis. (Ueber den Einfluss von Kolloiden auf die technische Zinkelektrolyse.) P. Röntgen & F. Felchner. *Archiv für Erzbergbau, Metallhüttenwesen,* Vol. 2, Mar. 1932, pages 26-48; Fritz Felchner. *Doctor's thesis, Technical Hochschule Aachen,* Feb. 1930, 32 pages.

Report from the Institute for Non-Ferrous Metallurgy and Electrometallurgy at the Technische Hochschule Aachen. Systematic experiments were carried on to study the effect of gelatine and glue on the electric deposition of chemically pure Zn from electrolytes of $ZnSO_4 + H_2SO_4$, of current density, variable content of acid and temperature of the electrolyte. Gelatine and glue decrease the current yield. The voltage of the electrolyte increases with increasing amount of colloids in the electrolyte. The yield of Zn is increased by a thermal decay of the colloids whereas the voltage decreases. In order to test whether the decrease of the current yield, as effected by the colloids added, is due to an increased solubility of the deposited Zn, comparative solubility tests were carried on on Zn cathodes which had been made from electrolytes with and without the addition of colloids. These tests resulted in a decrease of the corrosion for the Zn cathodes made from electrolytes with additions of colloids. With increasing electrolyzing temperature the yields are largest at low acid contents, they decrease with increasing content of gelatine, most at low temperatures. With increasing temperatures of the electrolyte the voltages show the largest differences at higher current densities. The differences are current consumption for various contents of acid and gelatine of the electrolyte are largest at low temperatures and gradually decrease with increasing temperature. A theoretical explanation of the occurrences at the electrolysis of $ZnSO_4 + H_2SO_4$ is obtained from the course of the current density-potential curves. The results of the investigation are plotted in numerous diagrams. 50 references. GN+Ha (7b)

Beryllium. Alfred Stock. *Preprint, The Electrochemical Society,* Vol. 61, Apr. 1932, pages 451-468.

The difficulty of obtaining Be by electrolysis in a fused electrolyte is due to the very marked affinity of the metal for O and C and to its high melting point (1300° C.). The author used a mixture of equal amounts of beryllium oxyfluoride and barium fluoride, operating the bath at 1400° C. Molten Be separates out at the water-cooled steel cathode. The extraction of Be from beryl is briefly described. For the quantitative estimation of Be in its ores, salts and finished products, a new analytical method was developed based on titration with chinalizarin. The properties and uses of Be are discussed. A particularly important field of application is the Be bronzes. LCP (7b)

The Production of Seamless Tubes from Materials of High Melting Points. (Die Herstellung von nahtlosen Röhren aus hochschmelzenden Stoffen.) J. A. M. van Liempt. *Metallwirtschaft,* Vol. 11, June 24, 1932, pages 357-359.

15 references. The method consists of depositing the metal by electro-chemical means or by thermal decomposition on a core and then dissolving the core away chemically. By this means small seamless tubes can be made from W, Mo, C, Pt metals, Ti, Zr, Hf and others. As an example W can be deposited from WCl_6 vapor at 2000° C. on a Mo core. The rate of deposition is from 5 to 25 mu/min. and there is practically no diffusion between the two metals. The Mo core is then dissolved in 85% conc. HNO_3 15% conc. H_2SO_4 at 90°C. The sp. gr. of the W tubes is about 19.22 and the tubes are vacuum tight. Tubes from 1 mm. dia., 3 cm. length, .1 mm. wall thickness to 12 mm. dia., 35 cm. length and 1 mm. wall thickness can be made. A single crystal W tube can be made by depositing on a single crystal Mo core. Very thin tubes can be made by depositing from a WCl_6 and H_2 mixture on a Cu core and melting out the Cu core. The tubes can also be drawn to a smaller size before removing the Mo core. CEM (7b)

METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Oxide Coatings on Aluminum. J. D. Edwards, M. Tosterud & H. K. Work. *Electrical Engineering,* Vol. 51, June 1932, page 406.

The characteristics of oxide films on Al are discussed and the large number of uses to which they have been practically applied are pointed out. The electrolytic rectifier and electrolytic condenser are among the most important utilizations. The oxide film is impermeable and has a high protective power. Its thickness can now be made comparable to that of a paint film. By a recently developed process they can be given a hardness like carborundum and of high dielectric strength for electrical insulation. Thick oxide films can also be colored by absorption of dyes or mineral pigments. Ha (8)

A Glance at Some Galvanizing Problems. Heinz Bablik. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 81-82.

The advantages and disadvantages of electro-galvanizing as compared to hot galvanizing are discussed. The practice of hot galvanizing as used in Central Europe is described. Good bending qualities are obtained by preventing the formation of Fe-Zn compounds in the coating which is accomplished by dipping the pickled and washed sheet in dilute Zn chloride solution, preheating the sheet to remove H, and adding Al to the Zn bath. PRK (8)

Gold Coating. (Kontaktvergoldung.) Top. *Deutsche Goldschmiedezeitung,* Vol. 35, Mar. 5, 1932, page 4; Apr. 2, page 4.

Description of a method for coating articles with Au. GN (8)

Rhodium-finish. An American Method for the Improvement of White Gold. (Rhodium-finish. Eine neue amerikanische Weissgold-Veredelung.) G. Nikolaus. *Deutsche Goldschmiedezeitung,* Vol. 35, Jan. 16, 1932, page 26.

After a brief discussion of the points to be observed in melting white Au, mention is made of a new Rh coating method on white Au articles to be used instead of the former Cr finish. GN (8)

Some Reactions Occurring in "Hot-Dipping" Process. Edward J. Daniels. *Institute of Metals, Advance Copy* No. 610, Sept. 1932, 14 pages.

Quantitative study of the reactions between steel, flux and molted Zn proved that the dross in the Zn bath resulted from reactions between the bath and the flux rather than between the steel and the bath. The part played by the flux in any hot-coating operation is discussed. In coating steel with Cd or Pb, the compounds $FeCd_2$ and $FePb_2$ are formed and insulate the steel from further attack by the melt. These compounds are both magnetic and rise to the top of the bath. The action of molten Sn on an 8% Al bronze results in the formation on the bronze surface of the compound Cu_3Sn dissolving Sn and Al, which is only partly wetted by the Sn. 15 references. JLG (8)

The Tinning of Gray and Malleable Iron Castings. (Das Verzinnen von Grau- und Tempergusstellen.) E. Becker. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 1, 1932, pages 174-177.

The article describes the various methods of tinning which can be used in tinning castings of either gray cast iron or malleable cast iron. The various methods are outlined in detail and many practical hints are given to avoid failures. Hot tinning and electro-tinning gave the best coatings. GN (8)

Hard Facing in the Steel Industry. W. A. Moore. *Iron & Steel of Canada,* Vol. 15, Apr. 1932, pages 42-43; *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, pages 265-266.

See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 271. OWE+MS (8)

Corrosion Resistant Coatings on Steel Castings. (Korrosions Beständige Ueberzüge auf Stahlgussstücken.) Karl Roesch. *Stahl und Eisen,* Vol. 52, May 19, 1932, pages 493-494.

Method studied by E. Knipp consisted of mixing finely divided alloys with a binder, either 2 to 3% clay or water glass and pouring on a steel casting. Although this appears simple, it is a difficult matter to get good thick coats to stay welded onto the surface of a casting. A strong borax solution is used as a flux. Pure Ni and ferro-silicon do not weld on, while powdered Ni acts as a favorable addition agent to other alloys in making thick coatings. Altogether 14 pulverized mixtures were examined and all data is compiled in the table.

Knipp made some reminders for this type of coating work: (1) the coating should not be porous; addition of Ni gives better results; (2) a definite ratio should exist between thickness of casting and thickness of coating; (3) the casting should be poured in at the bottom of sand mold; the stream of metal does not have to be vertical to the mold wall; (4) the mold should be poured uniformly.

Testing the Zinc Coating on Galvanized Wires. Geoffrey K. Rylands. *Engineer,* Vol. 153, Apr. 22, 1932, page 445.

Author is chairman of the committee of the British Standards Institution responsible for issuing Specification No. 443 bearing the above title. He defends the retaining of the Cu sulphate dipping test which is known to be not entirely satisfactory. Definite rules were laid down for performing the test which should aid in giving accurate results. LFM (8)

Metal Spraying—the Process and Devices and the Influence upon Welding of Some Recent Developments. H. B. Rice. *Journal American Welding Society,* Vol. 11, Sept. 1932, pages 26-30.

Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 6, 1932. A description of the apparatus, some applications and costs of metal spraying. Greatest field for this process is the building up of worn machine parts and application of various metallic films to protect surface from corrosion. TEJ (8)

Experiments with Town Gas in a Modern Tin-plate Works. W. Clark Johnson. *Gas World,* Vol. 96, May 21, 1932, Industrial Gas Supplement, pages 11-15.

Paper presented before South Wales Branch of the Institution of Mechanical Engineers, Swansea, Apr. 12, 1932. The author considers the problem in the following order: the disadvantages of fuel oil; the essential features of tin-pot firing; early experiments with tin-pot firing; some of the results obtained; standard equipment required; the removal of waste gases; the annealing process; the cost of normalizing process; a model all-gas tinplate works. The discussion following the paper covered the questions on variation in temperature and reducing atmospheres. MAB (8)

Hard-Facing in Machine Manufacture. J. C. Huston. *Machinery,* Vol. 38, Mar. 1932, pages 513-514.

Gives many applications of hard facing in machine work. Discusses advantages and economies. Does not deal with methods of hard facing. RHP (8)

The Effect of Water Soaking Steel Upon the Weight of Zinc Deposited. Wallace G. Imhoff. *Brass World,* Vol. 28, July 1932, pages 142-143.

Water soaking was accidentally found to yield a heavier, but poorer, grade of deposit when galvanizing. The deposit is harder and more brittle. WHB (8)

A New Metallizing Process. (Ein neues Metallisierungsverfahren.) A. Karsten. *Oberflächentechnik,* Vol. 9, May 24, 1932, pages 100-101.

The process consists in rubbing-on or spraying-on of a metal on an intermediary layer between object and metallic layer. The intermediary layer is made up of a mixture of a powder with water which after drying forms a very resistant, fire-proof coating insoluble in water. The method can be applied for interior decorating; art-objects, brickwork, wood, etc.; rubbing-on gives only thin layers, while thicker metallic layers must be sprayed on. Color effects can easily be obtained by suitable additions. Ha (8)

Lead Coating with the Oxy-Acetylene Flame. (Das Verbleien mit der Sauerstoff-Acetylenflamme.) H. Kalpers. *Gas und Wasserfach,* Vol. 75, July 23, 1932, page 614.

Pb coating with the oxy-acetylene flame seems to be successful. Several practical examples are discussed. In Pb coating steel plates an intermediate layer of a 50% Pb-50% Zn alloy is suitably used which guarantees good adhesion. Advantages are high chemical resistance of Pb in combination with high mechanical strength of base metal. GN (8)

A New Heat Application for Galvanizing. W. H. Spowers. *Wire & Wire Products,* Vol. 7, July 1932, pages 226-227, 236-237.

The gas is made to burn with a "diffusion flame" in this process, that is with an intensely luminous flame which is obtained by letting the combustion air reach the gas by diffusion through the flame proper which thus becomes an intense source of radiant energy of relatively low temperature but high emissivity. The application of such flame to hot galvanizing by impact burners to a heat radiating refractory bed installed between flame and side of kettle is described; the advantage consists especially in reducing the dross considerably, sometimes up to 35% and corresponding addition to pot life. Ha (8)

Aluminum-coated Iron and its Use. (Aluminiumplattiertes Eisen und seine Verwendung.) *Aluminium,* Vol. 14, Apr. 30, 1932, pages 3-4.

Soft Fe with Al rolled on is recommended for many industrial purposes. Ha (8)

Wire Galvanizing Processes. L. D. Whitehead. *Wire & Wire Products,* Vol. 7, May 1932, pages 148-151, 166-169.

This instalment concludes a discussion on hot-galvanizing vs. electro-galvanizing in which various authors have contributed their views in favor of the one or the other process. Here the methods of the electric process as carried out by the Crapo process are defended against hot-galvanizing. An editorial comment reviews briefly the discussions, no decision was made as to which is the better process. Ha (8)

Mixture No.	Composition of Pulverized Mixture % Fe	% Si	% Cr	% Ni	Composition of Coating % Fe	% Si	% Cr	% Ni	Corrosion in % by HCl 1:5	HCl 1:1	H_2SO_4 1:20	H_2SO_4 1:10	H_2SO_3 5 %	$C_2H_4O_2$ 1:1	$C_2H_4O_2$ Conc.	KOH 2.5%	KOH 25%	H_2O
Ordinary Steel without any Coating 0.23% C, 0.35% Si, 0.70% Mn									100	100	100	100	100	100	100	100	100	100
1	55	45	..	..	84.3	15.7	...	...	58	61	700	380	88	26	7	76	220	49
2	25	75	..	..	83.8	16.2	...	...	56	60	610	350	84	24	7	72	220	50
3	20	60	..	20	86.5	10.2	...	3.3	58	81	900	910	88	103	73	98	254	60
4	15	45	..	40	84.4	9.6	...	6.0	29	62	925	845	74	43	45	54	194	54
5	10	30	..	60	79.8	10.9	...	19.3	16	48	900	835	66	34	37	33	88	40
6	5	15	..	80	69.6	4.2	...	26.2	9	29	560	650	58	17	25	59	45	38
7	5	15	..	80	56.3	8.3	...	35.4	36	31	67	48	71	29	33	57	67	46
8	30	50	20	..	74.7	17.7	7.6	...	280	71	600	440	79	30	11	90	224	81
9	30	35	35	..	62.4	18.1	9.5	...	290	77	622	450	72	28	9	83	218	84
10	30	20	50	..	63.0	19.1	17.9	...	122	58	296	330	60	6	4	15	92	39
11	11	16	13	60	37.9	7.8	4.8	25.3	21	79	26	46	41	8	12	28	112	55
12	17	18	25	40	43.6	10.5	11.2	21.9	20	70	92	192	55	5	17	47	110	47
13	23	19	38	20	49.3	16.9	17.6	14.8	47	112	290	810	43	6	7	61	155	28
14	30	8	47	15	41.3	5.2	39.7	13.8	13	25	32	19	79	10	12	131	286	57

DTR (8)

INDUSTRIAL USES & APPLICATIONS (9)

Nickel-Chromium Steel Spades and Shovels. *Nickel Bulletin,* Vol. 5, Apr. 1932, pages 81-82.

The steel for these implements is of the following composition: C 0.41, Si 0.35, Mn 0.63, S 0.025, P 0.023, Ni 1.28, Cr 0.80. They are forged at 900°-950° C. and annealed at the same temperature. The process of manufacture is described fully. Ha (9)

Nickel and Its Alloys in the Chemical Industry. (Les applications du nickel et de ses alliages dans l'industrie chimique.) *Revue du Nickel,* Vol. 3, Jan. 1932, pages 2-15.

General discussion. AH (9)

The Iron Road, a New Export Outlet for Iron Foundries? (Die "Eiserne Strasse," ein neues Absatzgebiet für Eisengiessereien?) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, pages 253-254.

Description of the cast iron road pavement, system Schmid. GN (9)

The Manufacture of Gears. *Nickel Bulletin,* Vol. 5, Apr. 1932, pages 73-80.

The plant, laboratory and working methods of the products of David Brown & Sons, England, are described and illustrated. For turbine gears where circumferential speeds up to 15,000 ft./min. are used, a Ni-Cr-Mo steel of the following composition and properties is used: C 0.28-0.32, Si 0.3, S 0.04, P 0.04, Mn 0.5-0.8, Ni 3-3.75, Cr 0.5-1.0, Mo 0.25-0.40; yield point 40 tons/in.^{2}, maximum stress 55-60 tons/^{2}, elongation 18%, reduction of area 50%, Izod impact value 40 ft. lbs. Ha (9)

Interesting Uses of Sheet Lead. *Sheet Metal Worker,* Vol. 23, June 1932, page 295.

The application of sheet Pb flashings to waterproof sidewalks, shower stalls or bathrooms, and chimney flashings is illustrated by sketches showing details of construction. Ha (9)

A Drilling Machine Made of Welded Steel Tubes. (Aus Stahlrohr hergestellte geschweisste Säulenbohrmaschine.) *Die Röhrenindustrie,* Vol. 24, July 30, 1931, page 185.

Some view points regarding the welded frame of drilling machines are set forth. EF (9)

Large Uses of Steel in Small Ways. 211th Article. Oil Burners. *Steel,* Vol. 90, Feb. 22, 1932, pages 28-30.

Domestic oil burners are being installed in the U. S. at the rate of 126,000 a year and commercial oil burners in offices, hotels and apartment houses at the rate of 3000 a year. There are only 20 lbs. of steel and 60 lbs. of cast Fe used in the average oil burner unit but the manufacture of storage tanks and piping raises the total steel consumption by the oil burner industry to 48,000 tons per year. JN (9)

Large Uses of Steel in Small Ways. 212th Article. Woven Wire Fencing. *Steel,* Vol. 90, Mar. 7, 1932, page 38.

Over 50,000 tons of steel are used annually in the production of woven wire fencing. The major portion of this is used on the farm. Other large uses are for enclosing industrial plants, parks, playgrounds, cemeteries, estates, airports and golf courses. JN (9)

Large Uses of Steel in Small Ways. 213th Article. Bullet Cores. *Steel,* Vol. 90, Mar. 21, 1932, pages 38, 40.

Since 1924, the U. S. Government has used on an average 55,860 lbs. of W-Cr steel and 100,000 lbs. of mild C steel annually in the manufacture of caliber .30 and caliber .50 bullet cores. Orders on hand call for the use of 178,300 lbs. of alloy steel and 444,600 lbs. of mild C steel for this purpose. JN (9)

Large Uses of Steel in Small Ways. 214th Article. Miniature Trains. *Steel,* Vol. 90, Apr. 4, 1932, page 48.

The production of miniature trains and equipment consumes 5,300 tons of steel annually. Only 25% of the output are wind-up units, the remainder being narrow and wide-gage electric trains. About 80% of the metal used is steel. The types of steel making up the various parts of these train sets are outlined and a short account is given of their manufacture. JN (9)

Chrome-Nickel Steel Trim has Concrete Backing. *Steel,* Vol. 90, Apr. 4, 1932, pages 38, 40.

A new use for corrosion-resisting steel as an exterior finish for buildings is shown in the construction of 2 new store buildings. Steel sheets are bent into the required shape and then backed intimately with a 4-5" layer of lightweight concrete. These metal and concrete units are set into the wall in the same manner as cut stone by means of a 3/16" mortar joint. Advantages of this method of construction are decreased danger of denting the steel by impact, greater resistance to twisting or warping of the metal, and the elimination of the possibility of moisture condensing on the inside of the steel sheet. JN (9)

Reducing Haulage Costs Through Proper Application of Bearings. S. M. Weckstein. *Mining Congress Journal,* Vol. 18, June 1932, page 14.

Anti-friction and tapered roller bearings play a major part in economical coal mining transportation. The following definite advantages are summed up: (1) Increased tonnage of coal handled per train by 60%, (2) Reduced car lubrication costs 79%, (3) Reduced car maintenance costs 75%, (4) Reduced track maintenance (due to wrecks) practically 100%, (5) Reduced power consumption per ton of coal hauled. DTR (9)

Preheaters Made of Alloy Steel. (Wärmeaustaucher aus Edelstahl.) Kurt Rummel. *Stahl und Eisen,* Vol. 52, June 9, 1932, pages 559-562.

Report 163 of Heat Section of Verein deutscher Eisenhüttenleute. The use of high grade or heat-resistant steel as a substitute for ordinary Fe preheaters opens up a new field. Preheating with heat-resistant steel may give temperatures up to 900° C. without any danger and afford a means of making large savings in fuel. For rolling mill, forging, and annealing furnaces, it was possible to cut fuel costs 20 to 30%, together with considerable increase in production. This data was actually derived from recuperators built of refined steel parts and operated in various mills by the Düsseldorf Heat Section. Illustrations of the various types of preheater construction are shown. DTR (9)

Aluminum Alloy Mine Skips and Cages. *Canadian Mining Journal,* Vol. 52, Aug. 1932, pages 362-363.

Several mine skips and cages have been built in Canada for Kirkland lake mines. Advantages of these are: lightness, and strength (with correct designing). WHB (9)

1 **Duralumin Mine Skips.** *Canadian Mining Journal,* Vol. 53, July 1932, page 297.

The skip body is constructed of duralumin plates and angles riveted together by means of duralumin rivets. Rollers and fillings are frequently made from duralumin forgings. To resist abrasive action of the ore and rock, skips are lined, as to their sides, with Mn- or bulletproof steel plates, and as to their bottoms with Mn steel plates or Luratex rubber liners. Duralumin skips are compared with steel skips. WHB (9)

2 **Comparison of Different Heat Insulators in Electric Cooking and Baking Tubes with Particular Reference to Aluminum Foil. (Vergleich verschiedener Wärmeisoliermittel bei elektrischen Brat- und Backröhren unter besonderer Berücksichtigung der Aluminiumfolie.)** *Elektrizitätswirtschaft,* Vol. 31, Mar. 31, 1932, page 150.

The heat insulation effect of kieselguhr, slag and glass wool is based on the great number of pores filled with air. The insulation space can also be effectively subdivided by metallic walls. The low radiation coefficient is of paramount importance which must also be maintained after oxidation. The following table compares the radiation coefficients of 3 metals:

3

Metal:	Polished State:	Oxidized:
Al	0.26	0.35
Cu	0.19	3.86
Fe	0.29	3.40

Tests in the Technische Hochschule Hanover confirmed the superior insulation properties of Al-foils, which are also distinguished by their low heat capacity, thus reducing the heating times. EF (9)

4 **Rational Use of Copper and Brass in Heating Installations for Heavy Oils. (L'Emploi rationnel du cuivre dans les installations aux huiles lourdes.)** *Cuivre et Laiton,* Vol. 5, June 30, 1932, pages 273-282.

General advantages and details of pipe line construction are described and illustrated. Ha (9)

Aluminum-Silicon Alloys as Piston Materials. *Engineering,* Vol. 133, Feb. 5, 1932, pages 172-173.

Outlines the various properties of Al-Si alloys which make them suitable for pistons. By proper heat treatment the Brinell hardness of Y-alloy can be increased from 80 to 125. The high thermal conductivity, the low density which is the lowest of all commercial Al alloys, and the very low coefficient of linear expansion of these high-silicon Al alloys are excellent properties for piston materials. LFM (9)

5 **Hoover Dam Penstocks Set Record for Size.** *Engineering News-Record,* Vol. 109, July 21, 1932, pages 79-80.

Penstock, control and discharge equipment involves the fabrication of 4,600 ft. of plate steel pipe 30 ft. in diameter; 1,900 ft. of 25 ft. pipe; 2,550 ft. of 13 ft. and 1,860 ft. of 8½ ft. pipe. CBJ (9)

Houses of Copper and the Building Crisis. (Les Maisons en Cuivre et la Crise de la Construction.) *Cuivre et Laiton,* Vol. 5, May 15, 1932, page 210.

The possibilities of an extended use of Cu in building construction for economical reasons are discussed on the basis of examples shown in the Building Exhibition in Berlin and compared with the construction of ferrous materials. Ha (9)

6 **New Welded Truss Design Uses Continuous Tension Members.** *Engineering News-Record,* Vol. 109, Aug. 4, 1932, page 136.

Details of design for welded roof trusses to be used in new welded buildings of the Westinghouse Electric & Mfg. Co. at Derry, Pa. and Mansfield, Ohio. CBJ (9)

The Molding and Casting of Architectural Decorations. *Inco,* Vol. 11, No. 2, 1932, pages 18-21.

About 6 tons of art castings in Monel metal are used in decorating the new Federal Reserve Bank Building in Pittsburgh, Pa.; the molds, castings and finished ornaments are illustrated. Ha (9)

7 **Resistance of Nickel to Hot Alkali.** *Inco,* Vol. 11, No. 2, 1932, page 13.

The diaphragms in the electrolyzers for the production of hydrogen have been successfully replaced by Ni where formerly asbestos was used. The holes in the diaphragms are less than 0.004" in diameter, some 5000 to 6000 holes/in.^{2} Ha (9)

The World's Largest Klönne Holder. *Gas Journal,* Vol. 198, May 25, 1932, page 440.

8 The new 6 million cubic foot Stacey-Klönne holder at Syracuse, New York, has just been completed for the Syracuse Lighting Company. It is the largest of its kind and the first to be used on this side of the world. Discusses the materials used and the construction of the gas holder. MAB (9)

The Grocery Store Goes Metal. *Metalcraft,* Vol. 8, Apr. 1932, pages 150-151.

Ni and Monel metal have been used for counters, display cases, etc. throughout the store of the G. M. McKelvey Company Department Store of Youngstown, Ohio. VVK (9)

9 **Test House Will Demonstrate Practicability of Enameled Steel Sheets in Residence Construction.** *Metalcraft,* Vol. 8, May 1932, pages 202-203.

A steel house faced with porcelain enamel is now being constructed at Cleveland. VVK (9)

Tantalum Used as a Binder for Tungsten Carbide. *Machinery,* Vol. 38, Mar. 1932, page 488.

The Firth-Sterling Steel Co. has experimented with tungsten carbide particles bound by an alloy containing Ta, W, C and Co. This appears to have some advantages over the older plain tungsten carbide or over tantalum carbide. RHP (9)

10 **Frameless Steel House Will Cost Less Than Ordinary Frame Dwelling.** *Metalcraft,* Vol. 8, Mar. 1932, pages 135-136.

A detailed account of the all-steel house announced by the Insulated Steel Floor & Wall Co. of Cleveland. VVK (9)

Ornamental Leadwork Has an Interesting Background of Tradition. R. L. Zeigfeld. *Metalcraft,* Vol. 8, May 1932, pages 184-189. Many applications of lead for ornamental and practical purposes are described. VVK (9)

Welded Constructions in a Large Mine. (Geschweisste Konstruktionen bei den Übertagebauten einer Grosschachtanlage.) ZOEPKE. *Der Bauingenieur,* Vol. 13, May 20, 1932, pages 297-302.

Detailed description of the welded construction of the German mine Zollverein, Essen-Katenberg. All parts of the coal washing plant and the coal conveyor system which have been welded are described. 2000 tons of steel have been welded in all in the above buildings. All constructions in sheet are welded; a saving in weight of 15% could thus be effected. These are the largest welded constructions in Europe. GN (9)

Smart Apartment Hotel Demonstrates Harmonious Use of Metal. *Metalcraft,* Vol. 8, May 1932, pages 178-181.

The use of metal such as Al for porte cochere, entrances, lobbies, etc., in apartment houses is illustrated in the Kennedy Warren Apartment Hotel, Washington, D. C. VVK (9)

Copenhagen's Copper Clad Building. *Metalcraft,* Vol. 8, Apr. 1932, page 152.

The 7 story Vesterport building in Copenhagen is entirely surfaced both sides and roof with Cu. 240,000 lbs. were used and it is expected, in that atmosphere, that the metal will weather with a bluish tint. VVK (9)

The Development of Steel Constructions in the Mining Industry. (Die Entwicklung der Stahlbauten im Bergbau.) R. WÜRKER. *Kohle und Erz,* Vol. 29, Mar. 1, 1932, pages 74-79; Apr. 1, 1932, pages 99-103; May 1, 1932, pages 138-139.

A detailed illustrated description of steel constructions in German mines built in the last decade. 12 references. GN (9)

Monel Metal Bolts. R. WORTHINGTON. *Bulletin T-1, International Nickel Company,* pages 2-8.

The properties of Monel metal bolts are laid down in curves and tables; their ductility in combination with highest strength make them particularly useful in the case of corrosion exposure. Examples of application on the keel of ships, under-water structures, outdoor power stations are illustrated. Ha (9)

Lead Roofs for Beautiful Appearance and Freedom From Maintenance Costs. R. L. ZEIGFELD. *Metalcraft,* Vol. 8, Apr. 1932, pages 164-167.

A description of old and new lead roofs with directions for using the metal for that purpose. VVK (9)

Long Continuous Girders at Cincinnati Terminal. TRUMAN P. YOUNG. *Engineering News-Record,* Vol. 109, July 28, 1932, pages 110-112.

146-ft., 45 ton girders were erected for the approach to Union passenger tracks. Details of girder design and construction are discussed. CBJ (9)

Metallurgy in the Railroad Field. A. E. WHITE. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Railroads, pages 11-14.

The foremost points of consideration in locomotive practice is safety first; any change in the materials used must therefore be subject to close scrutiny from this viewpoint. It is pointed out that in order to improve a given part changes in design should be considered which would minimize the chances for defects due to improper or improperly controlled manufacturing practice. The requirements on some materials used in locomotives are tabulated. Ha (9)

Light Metal Doors for Rapid Transit Cars. (Leichtmetalltüren für Schnellbahnwagen.) G. WAGNER. *Glasers Annalen,* Vol. 111, July 1932, pages 1-9.

The paper reports the practical experience of the German Federal Railway with cast Silumin doors and with riveted Lautal sheet doors. The latter type is the most appropriate and economic type developed in Germany. With a lower weight they are more stable and cheaper than any other construction. They are by 17.3% lighter than cast Silumin doors and by 7.5% lighter than the former Teakwood doors. GN (9)

Sheet Metal Airplane Construction. HERBERT WAGNER. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Aeronautical Section, pages 151-161.

Theoretical considerations of bracing and sheet metal covering of light metals, especially duralumin are analyzed with respect to arrangement, shaping and supporting and illustrated by many examples of constructions of German metal planes. Ha (9)

Wall Fillings of Aluminum. (Wandfüllungen aus Aluminium.) WERNEKKE. *Aluminium,* Vol. 14, Apr. 30, 1932, pages 1-2.

Al alloys with 1.25 Mn cast in sand molds are used for decorative purposes; color effects can be obtained by electrolytic treatment of the Al. The American practice in using such plates is mentioned. Ha (9)

Use of Chromium Plating for Decorative Purposes. HENRY WEITZ. *Metalcraft,* Vol. 8, June 1932, page 244.

A general article. VVK (9)

Nickel as a Catalyst in Chemical Reactions. (Le nickel catalyseur de reactions chimiques.) PAUL SABATIER. *Revue du Nickel,* Vol. 3, Jan. 1932, pages 18-20.

Ni is an excellent catalyst for hydrogenation reactions. It is therefore used in industry for hydrogenation of hydrocarbons, compounds of the aromatic series, benzene, carbides, phenols, amines, ethers, organic oxides, carbon oxides into methane, oils into solid greases. In order to be used as a catalyst, Ni must have been reduced from its oxides and must be in finely divided form. AH (9)

Three Important Principles for the Calculation of Ropes. (Drei wichtige Grundgedanken zur praktischen Seilberechnung.) F. SKROBANEK. *Zeitschrift des Österreichischen Ingenieur-und Architektenvereins,* Vol. 84, Feb. 12, 1932, pages 21-23.

The paper considers the effects on the deflection of strained ropes and wires of wind pressure, rigidity and temperature. GN (9)

Shipbuilding and Its Relation to the Steel Industry. H. GERRISH SMITH. *Year Book of the American Iron & Steel Institute,* 1931, pages 80-105.

See *Metals & Alloys,* Vol. 2, Oct. 1931, page 218. (9)

The Use of Hard Metal in Lathes. (Benutzung von Hartmetall in Revolverbänken.) J. NITSCHE. *Werkzeugmaschine,* Vol. 36, July 15, 1932, pages 243, 254.

The points to be borne in mind in rough-planing with hard metal tools are discussed. At any rate efficient rough planing with such type tools results from the cross-section of the chip. GN (9)

Rigid Welded Junction for Steel Frame Houses. (Geschweisster steifer Knotenpunkt für Stahlskelett- Hochhäuser.) G. ZUR NEDDEN. *Elektroschweissung,* Vol. 3, July 1932, pages 136-137.

Discussion of the advantages of welded frame pillars compared to riveted pillars. GN (9)

Characteristics of Piston Material, with Special Reference to Wear Resistance. (Characteristik von Kolbenmaterialien unter besonderer Berücksichtigung des Verschleisswerts.) E. W. KOCH. Doctor's thesis, 1931, Technische Hochschule Aachen. Paper, 8¼ x 11 inches, 47 pages. Mimeographed.

Failures of pistons in automotive engines through brittleness, fusion, thermal distortion, wear, etc. are discussed and illustrated. Piston operating temperatures and the temperature gradient through the piston are tabulated. In air-cooled airplane motors the center of a cast iron piston head may reach 240°-290° C. with Mg base alloys, 265°-280° C. with Al base alloys and 325°-450° C. with gray iron.

Factors in the usefulness of a piston are uniformity, specific gravity, thermal expansion, thermal conductivity, strength, ductility, hardness and wear resistance. In the last 4, the values at operating temperatures are important.

Data on these properties are recorded for some 40 materials used or suggested for pistons. A huge mass of data on wear resistance is presented. The wear tests were made in oil heated to 95°-100° C., on flat surfaces of 1 cm.^{2} area, held tangentially under a pressure of 8 kg. against rotating disks of cast iron 12 cm. diameter, at 1400 r.p.m. The width of the worn area on the specimen was taken as a measure of wear. The cast iron disks (or rather tires) were cut from automobile cylinders of unalloyed cast iron of 184 Brinell, and the specimens themselves from actual pistons. A comparison specimen from a heat-treated Nelson Bohnalite piston of 10% Cu, 1% Fe, 0.3% Mg with 145 Brinell was run in each test as a standard material. Various finishes were used on disks and samples, and in some cases the oil was diluted and in others abrasive was added to the oil. One apparatus carried the Bohnalite standard and one other sample, another carried the standard and 9 other samples, each with its own lever arm and loading weight.

It is not clear whether the cast iron surface was refinished before each test. The time of running varied from a few minutes to 300 hours. The width of the worn area is plotted in curves, and the ratio between that width on Bohnalite and on the other test specimens run simultaneously with it is tabulated and used as a wear index. The roughness of the cast iron surface was the largest factor in the rate of wear. Wear appeared to be controlled rather more by composition than by slight changes in hardness or heat-treatment. Under comparable conditions against gray iron, nitrided steel showed 1/5, hard steel 1/4, and other gray irons 1/3 to 2/3 the wear (width of worn area) as Bohnalite. Various Al Si alloys showed 0.6 to 0.9, various Al Mg alloys about the same, other alloys of the Al Cu class about the same, Y alloy 0.8 to 0.9 and the Mg base alloys 1.2 to 1.7. With diluted oil (2/3 benzine) the Mg base alloys showed much higher relative wear while the other light alloys did not greatly alter their positions relative to Bohnalite.

Koch tabulates the standings of the various alloys as to specific gravity, coefficient of expansion, thermal conductivity, wear resistance, high temperature strength (average of Brinells at 100°, 200° and 300° C.) and the room temperature elongation, gives each property a weighting factor according to the use the piston is to be put to, and adds the weighted values together to give a merit index for that use. For instance for a piston for use in a racing motor, specific gravity is multiplied by 3 and wear resistance and expansion omitted entirely, while for a slow speed Diesel, specific gravity has a weight of 1, wear resistance of 2. The 15 tables of merit indices cover the range from airplane engines to ammonia machines.

The merit index for ordinary automobile pistons puts the materials standing at the head of the list in the following order, Bohnalite, cast iron, a 20% Si complex Al Si alloy; for sport automobiles, Y alloy, Duralumin (forged), Bohnalite; for trucks, Bohnalite, Y, Titanal (an alloy similar to Bohnalite plus some 4% Si), cast iron, Al Si alloy; for busses, Bohnalite, cast iron, Y.

The 8 to 18% Mg alloys of Al are not included in this tabulation since only those alloys in commercial use are considered, but Koch thinks such alloys deserve much attention. H. W. Gillett (9)-B-

Improvements in Steels for Wood-Cutting Saws and Knives. HENRY B. ALLEN. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Wood Industries, pages 43-47.

It has so far not been possible to obtain a steel which would be satisfactory for both blade and cutting-edge of a saw for wood-cutting; the edge-holding properties will require a separation of edge and blade just as has been done in metal cutting. The difficulties of doing this and some typical steel compositions for saws and energy requirements for cutting different kinds of wood are given. See also "Improvement in Saw Steels Attributed to Alloys," *Metals & Alloys,* Vol. 2, Aug. 1931, page 153. Ha (9)

Steels for Modern Locomotive Construction. W. B. PICKERING. *Railway Engineer,* Vol. 52, Dec. 1931, pages 483-484.

The modern tendency towards the use of Ni alloy steels is referred to and typical compositions of such steels are given. (9)

Hand Forged Iron Lends Unique Interest and Charm to Restored University Buildings. F. G. NECKER. *Metalcraft,* Vol. 8, Apr. 1932, pages 144-149.

A description of the hand-forged wrought iron doors, lighting fixtures, etc. in the administration building of Fordham University. VVK (9)

Arc-Welded Jigs, Fixtures and Machine Tools. J. R. WEAVER. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 33-39.

The advantages of welded jigs and fixtures are pointed out and illustrated by many examples. Foremost among them over those of cast construction are production on short notice, strength combined with lightness and ease of alteration. See also *Metals & Alloys,* Vol. 1, July 1930, page 631. Ha (9)

HEAT TREATMENT (10)

Hardening and Tempering Razor Blades. E. C. Cook. *Heat Treating & Forging,* Vol. 18, May 1932, pages 303-305.

Strip is heated in tube furnaces, consisting of a cylindrical refractory lining encased in a steel-plate shell with gas burners located from the top on one side and from the bottom on the opposite side. The flame surrounds and heats an oval tube of heat resisting alloy, through which the strip passes. Furnaces are usually 9-12 ft. long, with a capacity of 7500-10,000 blades/hr. Gas atmosphere is maintained in the tube. Upon leaving the furnace, the strip passes between water-cooled dies, the upper die being counterbalanced. Blades are tempered preferably in strip form, small furnaces or dies being used. One manufacturer heats oil in a separate unit and pumps it through the dies, which are made of Nitralloy. New type of blades having a long center slot necessitates center annealing of the strip. This is done by means of fish-tail burners which fire through a slot in suitable water-cooled dies, generally similar to those employed for quenching, except that the slot is in the center. MS (10)

Deformation of Steel in Heat Treatment. Portevin & Sourdillon. *Iron Age,* Vol. 129, Feb. 25, 1932, page 492.

Abstract translation of article in *Revue de Metallurgie,* June & July 1931. See *Metals & Alloys,* Vol. 2, Nov. 1931, page 263. VSP (10)

Heat Treatment of Rails. *Metallurgist,* Jan. 1932, pages 3-5; Feb. 1932, pages 19-21.

Extended abstract of a paper by Viteaux in *Revue de Metallurgie,* Vol. 28, Apr. 1931. See *Metals & Alloys,* Vol. 2, Oct. 1931, page 219. VVK (10)

Hardening (10a)

The Essentials of Hardening Simple Tools and Parts. Fred T. Potter. *Modern Machine Shop,* Vol. 5, July 1932, pages 7-11.

The practical methods to be followed in the hardening and tempering of small high speed and C steel sections are outlined. Ha (10a)

Magnetic Hardening of Steel. (Magnetisches Härten von Stahl.) E. G. Herbert. *Maschinenbau,* Vol. 11, Feb. 18, 1932, page 80.

Hardness of steel was greatly increased by revolving it in a strong magnetic field. After some time, however, the gain in hardness was lost again. New experiments for the purpose of retaining the increase in hardness were successful. This was made possible by a second treatment of a similar kind which is applied after a certain length of time which is determined by the grade of hardness desired. The second treatment takes 3 minutes without any previous heating whereas the first takes place at about 200° C. This temperature varies a little acording to the quality of steel. Practical use was made with razors, spiral drills, etc. RFV (10a)

Blocks Provide Neutral Atmosphere for Hardening. *Steel,* Vol. 90, Feb. 29, 1932, page 26.

A short description of the hollow, rectangular-shaped blocks made by the Sentry Co. of Taunton, Mass., for hardening high-speed tool steel. These blocks are molded of a carbonaceous mixture which generates gases and provides a neutral atmosphere which prevents scaling, decarburization and carburization of the steel placed inside the block. JN (10a)

Theory and Practice of Steel Hardening. (Zur Theorie und Praxis der Stahlhärtung.) F. Wever. *Stahlbautechnik,* Supplement to *Montanistische Rundschau,* Vol. 24, May 1932, pages 7-8.

Abstract of a paper appearing in *Archiv für Eisenhüttenwesen,* Vol. 5, Jan. 1932, pages 367-376. See *Metals & Alloys,* Vol. 3, May 1932, page MA 131. GN (10a)

The Hardening of Steel. (Ueber die Stahlhärtung.) Hans Esser & W. Eilender. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 32 pages. See *Metals & Alloys,* Vol. 2, Apr. 1931, page 82. Ha (10a)

Annealing (10b)

Gas Fired Unit Bright Anneals Copper Wire in Atmosphere of Steam. J. B. Nealey. *Gas World,* Vol. 97, July 16, 1932, Industrial Gas Supplement, pages 11-13.

The author discusses the essential parts of the furnace, the details of operation, the minimum amount of handling of the product which is necessary and the efficiency of the product. MAB (10b)

Annealing High-Speed Steel Tools in the Electric Furnace. Wirt S. Scott. *Machinery,* Vol. 38, Mar. 1932, pages 530-531.

An electric pit furnace automatically controlled by pyrometers is used. Sulphur-free coke is used to pack the samples. 7 hours is required for heating, 13 for cooling. Temperature used is 1652° F. The annealed material from this process is dead soft. See also *Metals & Alloys,* Vol 3, May 1932, page MA 131. RHP (10b)

Bright Annealing of Steels in Hydrogen. Floyd C. Kelley. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 378-385.

Includes discussion. See *Metals & Alloys,* Vol. 2, Apr. 1931, page 82. (10b)

Case Hardening & Nitrogen Hardening (10c)

Make Your Own Carburizing Compound. *Iron & Steel of Canada,* Vol. 15, July 1932, page 84.

A brief article on a method adopted by a manufacturer for the preparation of carburizing compounds containing hardwood charcoal, coke, barium carbonate, and sodium carbonate. Full details are given. OWE (10c)

Case Carburizing in Fused Cyanides. H. B. Northrup. *Iron & Steel Industry & British Foundryman,* Vol. 5, Nov. 1931, pages 51-52.

Case carburizing in fused cyanides is least understood of all methods of case carburizing. Molten NaCN has both a carburizing and a nitriding action upon steel. Nitriding occurs when the steel is immersed in the bath, and as the temperature rises action becomes more carburizing and less nitriding, at 1550° F. the nitriding function almost ceases. Bath concentrations are maintained at 25% NaCN, it being diluted with NaCl and Na_2CO_3. CHL (10c)

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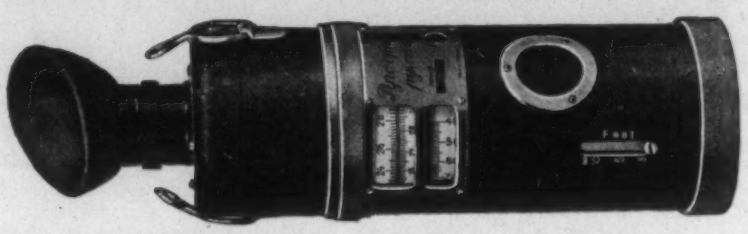

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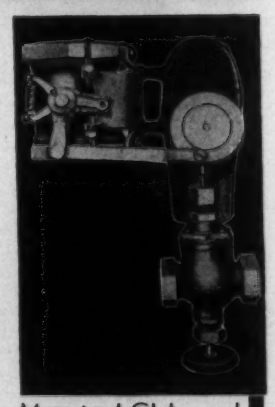

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The Nitriding of Iron and Iron Alloys. II. (Ueber die Nitrierung von Eisen und Eisenlegierungen. II.) OSKAR MEYER & RAMON HOBROCK. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, pages 251-260.
See *Metals & Alloys,* Vol. 3, May 1932, page MA 132.
Ha(10c)

Heat Treatment and Carburizing of Steel in Salt Baths. (Die Wärmebehandlung und Kohlung von Stahl in Salzbädern). THEWS. *Die Metallbörse,* Vol. 22, Jan. 23, 1932, pages 98-99.
The procedure of the case hardening process in cyanogen baths is considered at length. The following data are given: 0.25-0.50 mm. depth of case is desired at 850-950° C., which temperature should be maintained during 1-2 hours. Larger depths of 1-1.25 mm. demand 960° C. and 4-5 hours, after which a heat-treatment should be applied (German practice). The number of the various mixtures is boundless. For small parts 30-35 % NaCN + 35-40 % NaCl + 30 % Na_2CO_3 yield a sufficient case. The melting point of this mixture, the stability and economy of which are stressed, is about 640° C. The cyanogen baths exert a carburizing and nitriding effect. At lower temperatures, the latter prevails and stops at about 880° C. In case of steel the following mixture is recommended which should include only the purest materials: 45% $BaCl_2$, 40% NaCl, 15% KCl. The succeeding heat-treatment of the case-hardened steel is carried out in K-Na-nitrate mixtures. In England a 70/30 Na-K-NO_3 mixture at 130° C. has been recently suggested. For special purposes, the following very low melting bath is given: 25 potassium nitrite, 30 potassium nitrate, 20 sodium nitrite and 25 sodium nitrate.
EF (10c)

The Nitrogen Hardening of Alloy Steels. (Die Härtung legierter Stähle durch Stickstoff.) O. MEYER. *Stahl und Eisen,* Vol. 52, May 26, 1932, page 514.
Summary of use of Al, Cr, V, Mo and Ti nitrides for nitrogen hardening of alloy steels, originally published in Zeitschrift Verein deutscher Ingenieure, Vol. 76, 1932, pages 317-320. These nitrides are very difficultly soluble in Fe and with pearlite form the characteristically hardened surface of nitrided steel. The very low solubility and conditions of formation for the blending explain the basic difference between case hardening and nitrogen hardening. The particular role played by H in hardening needs explanation.
DTR (10c)

Valuation of Carburizing Compounds. (Bewertung von Einsatzmitteln.) H. MUELLER. *Maschinenbau,* Vol. 11, Feb. 4, 1932, pages 55-57.
Provided that the tests are made under equal conditions, a mathematical formula is given to evaluate the usefulness of various compounds. In this formula the following factors are taken into account: Price of the compound, simple and safe application, amount of detrimental components such as S and P, grain size, inclination to sintering, number of repeated applications possible, losses, speed of effect, depth of the carburized zone, gradual transition of the carburized zones, carbon content of the surface (to be about 1%, varying with the purpose of hardening). The factors are discussed at length. Though the formula looks complicated, its usefulness is proved by a number of experiments.
RV (10c)

The Nitriding of Iron and Its Alloys. I. Ammonia Dissociation and Nitrogen Absorption in the Nitriding Process. II. Observations on Case Properties of Nitrided Iron and Its Alloys. A. W. COFFMAN. *Industrial & Engineering Chemistry,* Vol. 24, July 1932, pages 751-754; Aug. 1932, pages 849-856.
In contact with the steels under consideration, ammonia decomposition becomes nearly complete at 800° C., while the rate of change of ammonia concentration with the change of temperature becomes a maximum at some definite temperature coincident with the temperature of maximum absorption. The temperature of this coincidence depends upon the steel. Seven references are cited. Observations have been made on the nitriding characteristics of pure Fe and a series of alloys of pure Fe with C and either Mo, Al, Mn, Cr, Ni, or Cu. All alloys investigated showed a critical temperature for maximum nitrogen absorption. This temperature varied with the chemical composition of the alloy. Pure Fe absorbed more nitrogen than any of the alloys, while addition of any other element decreased nitrogen absorption to a large degree. Great ability of an alloy to absorb nitrogen does not necessarily mean great hardness. Nitrogen penetrated pure Fe more readily than its alloys. The greatest resistance to atmospheric corrosion was developed by nitriding an alloy at the temperature at which the alloy absorbed a maximum amount of nitrogen. It has been shown that maximum hardness is not to be expected when maximum corrosion resistance is obtained.
MEH (10c)

On the Nitriding of Iron and Iron Alloys. I. (Ueber die Nitrierung von Eisen und Eisenlegierungen. I.) W. EILENDER & OSKAR MEYER. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule Aachen,* Vol. 11, 1932, 10 pages.
See *Metals & Alloys,* Vol. 2, Sept. 1931, page 177. Ha (10c)

Development of Continuous Gas Carburizing. R. J. COWAN. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 386, 403.
Includes discussion. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 309. (10c)

A Suitable Hardening Compound. (Ein brauchbares Härtemittel.) C. DINGELSTEDT. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur- Betriebstechnik,* Vol. 65, Apr. 10, 1932, pages 50-51.
The properties of normal and particularly of burned steel are claimed to be considerably improved by packing the steel before quenching in the compound "Restavem" (composition not given). The structures given actually show an improvement and the results of physical tests seem to prove the claim. It is claimed that not only the structure of superheated but even of totally burned steels can be regenerated by Restavem. Examples are given which show that the properties of quenched burned steels were even better than that of steels with a normal structure.
GN (10c)

Quenching (10d)

Some Remarks on the Paper by Captain Chanzy on Quenching Cracking. (Note au sujet du mémoire de M.le Capitaine Chanzy sur les tapures de trempe.) A. SOURDILLON. *Revue de Métallurgie,* Vol. 29, June 1932, pages 301-305.
The data presented by Chanzy (*Revue de Métallurgie,* Vol. 29, June 1932, pages 281-300) were checked experimentally and the shape of the cooling curves was verified. The use of furnaces for subdivided quenching must be restricted in the light of the cooling media employed in them. Hot air is not, for example, sufficient to produce the same effect as the cool air of the usual practice. As long as there is a definite critical speed of the decomposition of austenite the cooling medium must produce it in the first stages of cooling. Davenport and Bain's results (*Technical Publication* 348, *American Institute Mining & Metallurgical Engineers*) show that austenite decomposition at a constant temperature under 300° C. results in martensite alone while above it troostite and pearlite are formed. Using the baths as recommended by Chanzy care must be taken to adjust their temperatures so that the range would be small enough to prevent cracking while the lower limit of it would be low enough to prevent other than martensitic decomposition even when the steel is left at it for some time.
JDG (10d)

Quenching of Alclad Sheet in Oil. HORACE C. KNERR. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 487-493.
Includes discussion. See *Metals & Alloys,* Vol. 1, Dec. 1930, page 913. (10d)

Aging (10f)

Structural Hardening at High Temperatures of the Alloys of Iron and Tungsten (Durcissement structural a chaud des alliages fer-nickeltungstene). A. PORTEVIN, E. PRETET & H. JOLIVET. *Comptes Rendus,* Vol. 194, Apr. 11, 1932, pages 1237-1239.
Precipitation hardening has hitherto been applied in the main to the improvement of the mechanical properties of alloys at room temperature. The phenomenon, however, may be used to increase the strength of alloys at any temperature of utilization. This object may be attained by choosing an alloy which will be employed in service at temperatures corresponding precisely with those at which precipitation proceeds. The authors have investigated the possibility of increasing the strength of an alloy during use at high temperatures. In their experiments they examined a series of alloys of Fe, Ni and W, and in particular a group of such alloys containing 33% Ni. Using dilatometric and micrographic means, they have determined the solid solubility in Ni-austenite of a constituent which they referred to as "X," at temperatures varying between 800° and 1350° C. The results of their experiments are shown graphically. The precipitation of the dissolved constituent from the austenite, which becomes quite noticeable at 650° C., increases in rapidity at temperatures between 850° and 950° C. (according to the composition of the alloy). This precipitation results in an increase in the hardness of the alloys at room temperatures. That such an increase in hardness does occur has been shown by means of compression tests on an alloy containing 30% Ni and 25% W. Curves showing the results of these tests accompany the paper. The following test results are quoted for the 30/25 and 30/30 alloys, respectively.

Condition of Alloy	30/25	30/30
As cast	15.4 kg./mm.^{2}	26.7 kg./mm.^{2}
After 24 hr. at 850° C.	33.5 kg./mm.^{2}	37.0 kg./mm.^{2}

The possible importance of this effect upon the forgeability of these and other alloys is commented upon by the authors who note that analogous results may be expected when Mo is substituted for W in these alloys. They opine that the rate of precipitation of the solute compound may be modified quite considerably by the addition of such elements as Si or Cr.
OWE (10f)

Age Hardening of Copper Steel. S. STEINBERG & W. SUBOW. *Iron Age,* Vol. 129, Feb. 4, 1932, page 330.
Abstract translation of article in *Stahl und Eisen,* July 16, 1931. See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 42.
VSP (10 f)

The Aging of Steel. (Die Alterung des Stahles.) HERBERT MÜLLER. *Zeitschrift des bayerischen Revisionsvereins,* Vol. 36, June 30, 1932, pages 139-142.
The paper surveys the present status on the aging of steel and considers magnetic aging, mechanical aging and its influence on hardness, elongation and notch toughness. The influence of N, O, P, and Cu on the aging properties is discussed. Most significant for occurrences of aging is the increase of hardness in combination with a change of the capacity for deformation. In aging steels the transition zone from high to low values on the notch toughness—temperature curve is shifted to higher temperatures but the maximum values of notch toughness are lower than in non-aging steels. The occurrences of aging are compared to those in hardened steels. The effect of work hardening on the disintegration of supersaturated solid solutions and the possibilities of suppressing precipitations are pointed out. Brief mention of the processing of non-aging steels (Izett steel). 12 references.
GN (10f)

Age-hardening of Austenite. F. R. HENSEL. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 255-283.
Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 177. (10f)

Malleableizing (10g)

Annealing Pots for Malleable Iron. (Pots a Recuire le Malleable.) A. J. LE BLANC. *Revue de Fonderie Moderne,* Vol. 26, May 10, 1932, page 162.
A few data are given of annealing pots of a Ni-Cr alloy with 55-60% Ni. Such pots of about 50 cm. diameter, 50 cm. height, weighing about 60 kg., suffer a loss of weight of about 0.5 kg. per heat and stand about 50 heats. They do not oxidize.
Ha (10g)

JOINING OF METALS & ALLOYS (11)

Brazing (11a)

Boric Acid and Brazing. (Borsäure und Hartlötung.) ABUCH. *Deutsche Goldschmiedezeitung,* Vol. 35, Aug. 6, 1932, pages 2-3.

Suggestions as to the use of boric acid in brazing pieces of jewelry. GN (11a)

Soldering (11b)

Soldering the Stainless Steels. V. W. WHITMER. *Welding Engineer,* Vol. 7, Apr. 1932, page 31; *Metalcraft,* Vol. 8, Apr. 1932, page 172; *Steel,* Vol. 90, Apr. 4, 1932, page 40; *American Machinist,* Vol. 76, May 26, 1932, page 676.

As soldering is a joint of surface adhesion only the surfaces should be roughened to obtain a reliable union. This can be done by a rough file, emery wheel, or with a mixture of 50 parts ferric chloride in 100 parts HCl diluted 2 or 3 to 1 when applying to the surfaces. The surface is then suitable for tinning. The piece must be carefully cleaned afterwards. Ha+VVK+JN (11b)

Cadmium Solders for Soldering Silver. (Kadmiumlote zum Löten von Silber.) *Deutsche Goldschmiedezeitung,* Vol. 35, May 14, 1932, page 4.

A Ag solder with 30% Cu, 30% Zn, 20% Ag and 20% Cd has a high plasticity and strength and very low melting point. With increasing content of Ag and Cd the solders become thinner liquid but the tensile strength decreases. GN (11b)

Hard-Soldering of Aluminum. (Das Hartlöten des Aluminiums.) *Aluminium,* Vol. 14, May 31, 1932, pages 5-6.

A hard solder for Al contains at least 70% Al, the remainder is other metallic elements. A flux of the halides of the alkali metals is used. The flame must not be too hot, air-illuminating gas or air-acetylene is sufficient. The joint is very strong and can replace in some cases the welding which is usually employed for pure Al. Ha (11b)

Welding & Cutting (11c)

Importance of Welding Quality in Stainless Alloys. *Welding Engineer,* Vol. 17, Jan. 1932, page 37.

All stainless alloys now on the market are divided in 6 groups:

	% C	% Cr	% Si	% Ni
Group 1	over 0.20	12-16	....	....
" 2	less than 0.12	12-15	....	....
" 3	less than 0.12	16-20	0.50–1.50	....
" 4	.....	17-25	....	7.12
" 5	.....	7-25	....	17–22
" 6	less than 0.3	20-30	....	....

All of these can be welded. Welds made with groups 1, 2, 3 require heat treating to remove the brittleness produced next to the base metal. Group 4 which contains the majority of the stainless steels now on the market, welds very satisfactorily and leaves base metal and weld ductile after welding; they can even be cold-drawn. If castings are made of the alloys given in the table it is necessary that they be heat-treated after welding to obtain the maximum resistance to either heat or corrosion and to improve the strength and ductility of the casting. Ha (11c)

Non-Ferrous Metals. *Welding Engineer,* Vol. 17, Apr. 1932, pages 25-26.

General information on the best procedure of welding Everdur (96% Cu, 3% Si, 1% Mn) and Al is given and operation of torches and use of auxiliary tools explained. Ha (11c)

Electric Resistance Welding and High Speed Production. C. A. HADLEY. *Welding Journal,* Vol. 29, July 1932, pages 198-204.

Includes discussion. Paper read before the Members of the Midlands Branch of the Institution of Welding Engineers, Birmingham, Feb. 19, 1932. A study of the effect of time and current values is of great importance in production of quality spot welds. The author explains the physical and metallurgical effects of spot welding at various speeds. In order to avoid distortion and to obtain optimum efficiency the weld must be made at that speed which will heat the joint to a welding temperature but leave the external surface cold and unaffected. TEJ (11c)

The Strength of Arc Welded Joints. FRANK RICHARD FREEMAN. *Journal American Welding Society,* Vol. 11, June 1932, pages 16-24.

Extracts from paper presented before the Institution of Civil Engineers, Proceedings Institution of Civil Engineers, Vol. 231, Session 1930-1931, Part II. An investigation of arc welded full sized joints of all common types. The following strengths may be expected for the various types of joints. Longitudinal shear fillets, 4.8 tons/in. of ⅜" fillet; Transverse fillets, 8.0 tons/in. of ⅜" fillet; Butt welds, 16 tons/in.^{2} of weld. For compound welds the allowable stress is a mean of the strength of the transverse and longitudinal fillets and exceeds the strength of the longitudinal fillet by an amount proportional to the angle of slope of the length of the fillet to the axis of stress. Physical properties of all weld metal specimens are given. TEJ (11c)

Welding of Cast Electron Housings. (Schweissen von Elektronguss Gehäusen.) HANS A. HORN. *Autogene Metallbearbeitung,* Vol. 25, May 1, 1932, pages 135-138.

Electron castings are used extensively in the construction of automobiles and aeroplanes; it contains up to 90% Mg and between 4 to 10% Al, 3% Zn, and 0.2 to 0.5% Mn. The cast material has a specific gravity of 1.8 and a melting point of 620° C. The tensile strength of 17 to 23 kg/mm.^{2} is always attained and even exceeded in the welds. Its behavior in the flame is quite different from Al and its alloys on account of its inflammability. Special electron welding rods must be used. Welded pieces should not be moved until cold as they easily deform; the welder must therefore be very skillful to use his torch in all positions, especially overhead. The welding flame should be only half as hot as for Al welding. The preparation and treatment of the pieces before and after welding is described and a few examples of repairs illustrated. Ha (11c)

Arc Welding in Tramway Operation. (Lichtbogenschweissung im Strassenbahnbetrieb.) G. HAFERGUT. *Elektroschweissung,* Vol. 3, Aug. 1932, pages 151-154.

The savings to be effected by street railways by repairing and building cars, track parts, etc. by electric welding are dealt with. Welding of rails and frogs is discussed. Rail joint testing is briefly touched upon. 2 references. GN (11c)

On the State of Stress and the Strength of Weld Seams. (Ueber den Spannungszustand und die Festigkeit von Kehlnähten.) E. HÖHN. *Schweizerische Bauzeitung,* Vol. 99, May 14, 1932, pages 257-260; May 21, 1932, pages 263-266.

Extensive experimental investigations and calculations on the state of stress in weld seams. Determinations of stresses in seams. 9 references. GN (11c)

Repairing Oil Trunk Lines by Arc Welding. ALBERT N. HORNE. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Petroleum Mechanical Engineering, pages 33-35.

Data are given for repairing oil trunk lines by electric welding without interruption of service. Corroded or pitted lines can be patch-welded very economically. Ha (11c)

Methods of Controlling Arc Blow. R. W. HOLT. *Welding Engineer,* Vol. 17, Mar. 1932, pages 40-42; Apr. 1932, pages 44-46.

The electromagnetic causes of the arc being blown about are explained and the means for obtaining a steady arc discussed. The ground contact must be properly placed, that is, it should be in the rear of the traveling direction of the arc. Tipping of the electrodes, back-stepping, tacking, etc., are some of the more often applied remedies. Sketches illustrate the causes and remedies clearly. Ha (11c)

The Reinforcement of the Paradise Bridge in Zwickau (Saxony) by Electric Arc Welding. (Die Verstärkung der Paradiesbrücke in Zwickau i.Sa. im Elektroschweissverfahren.) F. HEMPEL. *Bautechnik,* Vol. 10, Apr. 8, 1932, pages 211-213.

The paper describes the reinforcement of the main and cross beams of the bridge by electric arc welding. Coated electrodes 4 mm. in diameter were used. GN (11c)

Ductility in Arc Welds with Some Reference to Strength Values. CHAS. H. JENNINGS. *Journal American Welding Society,* Vol. 11, July 1932, pages 28-29.

Discussion by J. C. Lincoln of paper published in *Journal American Welding Society,* Vol. 11, Apr. 1932, pages 37-42. TEJ (11c)

The Application of Electric Arc Welding in the Construction of High Pressure Vessels. (Die Anwendung der Lichtbogenschweissung beim Bau von Hochdruckbehältern.) E. JOELLENBECK & C. MASSMANN. *Elektroschweissung,* Vol. 2, Sept. 1931, pages 165-169.

The experiments reported are aimed to furnish data on the qualification of electric arc welding for producing thick-walled vessels. Welds were tested with the following results: Tensile strength and yield point of the welded parts are higher than that of the base metal, even at temperatures up to 500° C. The elongation is approximately the same as for the base metal, except for testing temperatures from 400° to 500° C. At these temperatures a decrease of the elongation takes place. The notch toughness is rather low. However, endurance bending and impact tests show that low values of notch toughness are of no great significance. X-ray radiographic examinations showed minor pores in some of the welds; the decrease of cross-section thus effected is more than compensated by the increase of tensile strength and yield point. The resistivity against corrosion of the welds was also tested. The results justify a higher valuation of good electric welds. The loads permitted for water gas welds should also be permitted for electric welds. GN (11c)

Procedure for Welding Large Everdur Pressure Vessels. CHARLES B. JACOBS. *American Machinist,* Vol. 76, Feb. 25, 1932, pages 272-274.

Describes the welding operations used in welding 2 Everdur tanks of 10,000 gal. capacity. By use of a reinforcement bead the strength of the weld slightly exceeded that of the parent metal. RHP (11c)

Welding Progress at the A. O. Smith Plant. T. MCLEAN JASPER. *Transactions American Society of Mechanical Engineers,* Vol. 54, Mar. 30, 1932, Petroleum Mechanical Engineering, pages 11-13.

A general description of the development of welding pressure vessels, testing equipment and test methods with some test results. Ha (11c)

Repair Welding of Cast Iron Armatures. (Reparaturschweissungen an gusseisernen Strassenarmaturen der öffentlichen Betriebe.) H. JÜRGENS. *Gas und Wasserfach,* Vol. 75, Feb. 6, 1932, 108-111.

In order to obtain welding seams of high strength, good corrosion resistivity and easy machinability the following points are to be observed: proper adjusting of the welding flame, selected filling rods and fluxes. Examples are shown of the welding of hydrants, public wells, lampposts, etc. GN (11c)

Electric Lay-on Welding in Street Railway Operation. (Elektrische Auftragsschweissung im Strassenbahnbetrieb.) HANS A. HORN & KARL TEWES. *Elektroschweissung,* Vol. 3, June 1932, pages 113-115.

The paper discusses the rules for properly filling up the grooves of worn tramway rails by welding. The duration of rails can thus be increased considerably. The following 3 types of welding rods are chiefly used in Germany.

Material	C %	Mn %	Si %	P %	S %	W %	Cr %
A	1.10	.25	.25	.04	.03	..	..
B	1.00	~14.0	.30	.08	.05	..	..
C	1.10	.30	.20	.03	.03	1.5	.8

In most cases A is used giving a Brinell hardness of from 280-320. B is austenitic, C gives a hardness up to 500. Proper choice of welding current and arrangement of the seam is emphasized. GN (11c)

Installing Pipes By Welding. (Rohrinstallation mit Schweissung.) W. JOHAG. *Gas und Wasserfach,* Vol. 75, Feb. 20, 1932, pages 148-151.

The paper surveys the principles to be borne in mind in the oxy-acetylene welding of pipes. In general, preparation of the weld seam is not necessary in common practice. The testing of welds is discussed. GN (11c)

Brands of Welding Wires and Their Testing. (Schweissdrahtsorten und Schweissdrahtprüfungen.) FR. HUTH. *Emaille-technische Monatsblätter,* Mar. 1932, pages 20-21.

General discussion. Welding wires must be entirely free from rust, scale, sand and oil. The surface is suitably examined with magnifying glasses. In order to simplify the testing the welding wires should be standardized. GN (11c)

Pressure Welding of Low-Carbon Steels with Theoretical Considerations on the Mechanism of such Welding. I, II. C. R. AUSTIN & W. S. JEFFRIES. *Journal American Welding Society,* Vol. 11, June 1932, pages 24-33; July 1932, pages 30-37.

Paper presented before the annual meeting of the American Institute Mining & Metallurgical Engineers, New York, Feb. 1932. See *Metals & Alloys,* Vol. 3, Apr. 1932, page MA 100. TEJ (11c)

New Welding Blowpipe Has Been Developed for Oxyacetylene Welding. T. W. GREENE. *Oil & Gas Journal,* Vol. 30, Apr. 21, 1932, page 48.

Paper before the American Gas Association Distribution Conference. A description of a new oxyacetylene welding blowpipe (Linde-Weld process of the Linde Air Products Co.) by which a welding speed of 3 to 3½ times that of the present process is obtained. See also "A New Process of Oxy-Acetylene Welding," *Metals & Alloys,* Vol. 3, Apr. 1932, page MA 100. VVK (11c)

Electrically Welded Bridge. (Elektrisch geschweisste Brücke.) STEFAN BRYLA. *Elektroschweissung,* Vol. 3, Aug. 1932, page 158.

Description of construction and welding of a bridge built in Lowicz, Poland. GN (11c)

Notes on Arc-Welding in Bridgework in Australia. W. D. CHAPMAN. *Iron & Coal Trades Review,* Vol. 124, June 17, 1932, page 995.

Up to the present 136 bridges (highway and railway) have been repaired or constructed by arc-welding in Australia since 1924. The main applications in repair work have been relief of rivet stresses, the addition of extra section to flanges of plate girders and truss members, stiffening of long columns, correction of minor faulty details and repair of wastage of section due to corrosion. Advantages as compared with older method were less cost, and less interference to traffic. New welded bridges are used so far only for joist or broad-flange beam spans, but these yielded considerable savings over the older riveted methods. Mild steel covered electrodes were used exclusively. The work has been proved to be absolutely satisfactory. Ha (11c)

What Does It Cost to Weld Pipe Fittings? ARTHUR E. CHRISTEN. *Welding,* Vol. 3, July 1932, pages 429-434; Aug. 1932, pages 488-490.

A discussion of the time and materials required for oxyacetylene welding various pipe connections. TEJ (11c)

Flame Cutting of Low-Carbon Steel. J. R. DAWSON. *Journal American Welding Society,* Vol. 11, June 1932, pages 5-6.

Paper presented at the Oct. 20, 1931, meeting of the New York Section of the American Welding Society. Precision flame cutting of steel is possible with the modern cutting torch. Higher C and alloy steels are usually preheated before cutting while low C steels do not require preheating. TEJ (11c)

The New Symbols for Welded Joints according to German Industrial Standards 1912. (Die neuen Zeichen für geschweisste Verbindungen nach DIN 1912.) A. HILPERT. *Autogene Metallbearbeitung,* Vol. 25, June 1, 1932, pages 161-162; *Stahlbau,* Vol. 5, Aug. 5, 1932, pages 127-128.

The new German Standard symbols for welded joints, welding process and their designations are reproduced in full. Ha+GN (11c)

A New Welding Material for Manganese Steel. JOHN HOWE HALL. *Iron Age,* Vol. 129, Mar. 3, 1932, page 540; *Welding Engineer,* Vol. 17, Jan. 1932, pages 39-41.

Describes a special Mn steel developed by the Taylor-Wharton Iron & Steel Co. known to the trade as "Timang". Its chemical composition is 0.60 to 0.80% C, 12 to 15% Mn and approximately 3% Ni. In addition to its use as a welding material for Mn steel "Timang" is made in the form of castings, rods, plates and sheets. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 310. VSP+Ha (11c)

Modern Welding Methods, Fusion Welding, Electric Resistance Welding, Cutting. (Neuzeitige Gas-, Elektro-, Gaselektro-, Flammverschmelzungsverfahren, elektrische Widerstandsschweissung und Brennschnitt.) KRYNES. *Zeitschrift des Österreichischen Ingenieur- und Architektenvereins,* Vol. 84, Mar. 11, 1932, pages 48-49; June 3, 1932, pages 112-115.

Report on papers before the Fachausschuss für Schweisstechnik of the Osterreichischen Ingenieur-und Architektenvereins. GN (11c)

The New Resistance Welding. M. L. ECKMAN. *Welding Engineer,* Vol. 17, Feb. 1932, pages 42-44.

A general discussion of present methods, machinery and quantity production. Speed and uniform quality are best obtained with this welding method. Ha (11c)

The Costs of Electric Arc Welding. (Die Kosten der Lichtbogenschweissung.) WALTER MOHR. *Elektroschweissung,* Vol. 3, July 1932, pages 132-134.

The paper considers the costs of electric arc welding under the following groupings: (1) material, (2) wages, (3) current, (4) depreciation, maintenance, interest, (5) charges. The factor of prime importance is the welding time. The welding time should be abbreviated by suitable devices, automatic welding, suitable electrodes, etc. GN (11c)

Inspection and Tests of Welding in Structures. F. EDER. *Journal American Welding Society,* Vol. 11, June 1932, pages 11-15.

Paper presented at the Apr. 1932 meeting of the Philadelphia section of the American Welding Society. For consistent and proper quality of welding in shop and field it is essential that a competent inspector supervise the welding operations, systematically throughout the whole period during which welding is done. The author gives details of arc and gas welding procedure, pointing out those important details which the inspector should particularly note. Tests to determine quality of welds are suggested. TEJ (11c)

Fusion Welding and its Application for Storage Batteries. (La Soudure Autogene et son Application aux Accumulateurs.) C. FRANCHE. *L'Industrie Electrique,* Vol. 41, Feb. 25, 1932, pages 87-88.

It is pointed out that in spite of the great heat of the oxy-acetylene flame it is suitable for welding Pb with its low melting point if the flame is made very small so that the intense local heating effect is utilized. In that case, the process is very economical, about 25 l. gas/hr. are consumed. The particular application for the assembly of storage batteries is illustrated. Ha (11c)

Concerning Crater Formation. GILBERT E. DOAN. *Journal American Welding Society,* Vol. 11, July 1932, pages 17-18.

Crater formation in arc welds is caused by (1) lowering of surface tension of the liquid Fe at the center of the molten puddle due to the higher temperature at that point; (2) pressure of a gas or electron stream that seems to originate at the electrode tip and blow the metal outward from the center of the molten puddle. TEJ (11c)

Spot-Welded Stainless in Aircraft Construction. C. DEGANAHL. *Welding Engineer,* Vol. 17, June 1932, pages 30-31.

The process of electric spot-welding 18-8 alloy is described. Safe welds require very exact timing and good metallurgical knowledge of the material; heated to between 500° and 900° C. the C has a tendency to come out of solution and to combine with Cr to form Cr carbide which leads to a dangerous corrosion. With the electric method the heating and cooling is so rapid that the C has no time to come out, while this easily occurs with gas welding. Ha (11c)

Influence of the Fiber Direction on the Tensile Strength in Electric Resistance Welding. (Einfluss der Faserrichtung auf die Festigkeit bei der elektrischen Widerstandsschweissung.) FÜCHSEL. *Elektroschweissung,* Vol. 3, Aug. 1932, pages 147-148.

In electrically welding together vertical plate-shaped pieces which have a fibrous structure with prismatic or tube-like pieces, the parts joined show at least the tensile strength of the base metal when the fiber direction of both of the pieces to be joined is vertical to the welded face. This statement was found to be substantiated on German standard steels: St. 37, C about .1%; St. 50, C about .35%. GN (11c)

Pipe Line Welding as Seen From Standpoint of User of Welding. R. S. FULLER. *Oil & Gas Journal,* Vol. 30, Apr. 21, 1932, pages 45-47.

Paper presented before the American Gas Association Distribution Conference. A very comprehensive discussion of pipe line welding from the standpoint of the welder and the pipe line layer. VVK (11c)

Welded Rail Joints. (Der Schweissnahtstoss). J. FRANKE. *Zeitschrift des Österreichischen Ingenieur-und Architektenvereins,* Vol. 84, Feb. 12, 1932, pages 24-25.

Description of some methods of joining rails by welding. Special type fish-plates are suitably used. GN (11c)

The Structure of Welds of Soft Steels. (Ueber das Gefüge der Schweissungen von weichen Stählen.) H. GERBEAUX. *Die Schmelzschweissung,* Vol. 9, June 1932, page 132.

Soft steels with not more than 0.3% C which consist exclusively of ferrite crystals and pearlite fields of small area show the following changes at welding with the oxy-acetylene flame: The material close to the weld is heated whereby at first an increase in the grains is produced which later is reduced as the size of the grains increases. The rapidly solidifying material shows numerous crystallization centers so that the structure of the fused material becomes similar to the heated material in the neighborhood. The metal grows inversely to the cooling velocity and its size depends especially on the velocity with which it passes through the Ar_3 point. Below this transformation point, the ferrite begins to separate from C. When Ar_1 is reached pearlite is precipitated. The grain of the weld is coarser than that of the metal resulting in a reduction of the notch-toughness of the weld. The elongation decreases and the hardness increases slightly. Ha (11c)

Welding Monel Metal Dye-Handling Equipment. *Textile World,* Vol. 81, Apr. 16, 1932, page 41.

Dye measuring equipment, dye receivers and scoops for handling dry and liquid dyes are made of Monel metal sheets and welded by the oxy-acetylene torch. Ha (11c)

Electric Welding of Thick Walled Vessels. (Elektroschweissung dickwandiger Gefässe.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 29, 1932, page 292.

This is the abstract of a paper by W. Prox before the Committee on Welding Technique of the Verein deutscher Ingenieure, Apr. 22, 1932. Arc welds with common uncoated wire show insufficient plasticity and notch toughness. N was found to be the reason of this brittleness. (See the simultaneously published paper by F. R. Hensel & E. I. Larsen: Age Hardening Phenomena in typical fusion-weld metal. *Transactions American Society for Steel Treating,* Vol. 19, May 1932, pages 639-672). Besides N, O and S impair the mechanical properties of the weld. Comprehensive tests were carried on with all types of welding wires on the market in Germany. New suitable coated wires were developed for the new Pintsch welding method which is not described in the paper. Structures of welds made according to the new method show that the C does not burn during welding, pearlite shows the same structure as in the base metal, needles of nitrides are absent. Unannealed Pintsch-welds show a notch toughness of from 10.3—13.6 mkg/cm.², after annealing to eliminate stresses a notch toughness of from 11.5 to 15.3 mkg/cm.². The advantages of machine welding are pointed out. GN (11c)

Electric Welding in Ship Construction. *Engineering,* Vol. 133, Feb. 12, 1932, page 183.

Brief comment on recent publication of the British Corporation Register of Shipping and Aircraft entitled "Provisional Rules for Electric Arc Welding in Ships." LFM (11c)

WORKING OF METALS & ALLOYS (12)

Production of Aluminum Foil. (Herstellung von Aluminiumfolie.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 22, 1932, pages 277-278.

Description of the processing of Al foil from ingot to the finished foil. GN (12)

Melting & Refining (12a)

The Melting of Metals in Modern Oil Furnaces. (La Fusion des Métaux dans des Fours à Huile Moderne.) *Revue de Fonderie Moderne,* Vol. 26, June 25, 1932, pages 207-208.

The purity of metals melted in a crucible can also be obtained in larger quantities in open-hearth furnaces with proper flames. The use of fuel-oils and the advantages are discussed briefly; among the latter is particularly the lower burning of Zn and Cu, and usually the slag can rise better to the surface which is of importance in the melting of Al. Ha (12a)

Coreless Induction Furnaces. *Iron & Coal Trades Review,* Vol. 125, July 1, 1932, page 13.

The advantages of the coreless induction furnace in melting of alloy scrap are economy, easy control of the temperature and reduction of contamination of the metal to a minimum. A few examples illustrate this. Ha (12a)

The Application of Deoxidizing Materials at the Finish of the Charge in Acid and Basic Open Hearths. Short Literature Survey. (Om användning av desoxidationsmedel vid avslutning av chargen i sur och basisk martinung. Kort litteraturöversikt.) S. Ekelund. *Jernkontorets Annaler,* Vol. 116, May 1932, pages 231-243.

A review. HCD (12a)

The Acid Electric Furnace in the Steel Foundry. (Der säure Elektroofen in der Stahlgiesserei.) R. Genwo. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 10, 1932, pages 274-277.

Whereas most of electric steel in U. S. A. is made in acid furnaces, most of the electric steel in Germany is made in basic furnaces. The paper discusses at length the mode of operation of acid furnaces for straight C as well as alloy steels. The high capacity, cheap furnace lining and maintenance, simplicity of operation and good properties of acid electric steel are particularly pointed out. GN (12a)

Preparation of Pure Magnesium by Sublimation. (Herstellung von reinem Magnesium durch Sublimation.) *Die Metallbörse,* Vol. 22, Mar. 9, 1932, page 307.

Highly pure Mg is obtained at a rapid rate by sublimation at 600° C., i. e. 150° C. below its melting point, at a pressure of 0.01 mm. Hg. The metal deposited on water-cooled plates contains less than 0.001% Si. Small contaminations of NaCl and $MgCl_2$ show up at the surface. EF (12a)

The Design and Operation of Open-Hearth Furnaces. C. W. Veach. *Rolling Mill Journal,* Vol. 5, Aug. 1931, pages 527-530; Sept. 1931, pages 587-590; Nov. 1931, pages 707-709; Dec. 1931, pages 767-770, 790-791.

Discusses the procedure of charging lime into the open-hearth furnace, describes the principles of combustion and discusses the means and necessity for control of the bath temperature and the oxidation conditions and slag building. Ha (12a)

Design and Operation of Open-Hearth Furnaces. XIII-XVI. C. W. Veach. *Rolling Mill Journal,* Vol. 6, Jan. 1932, pages 23-24, 29-30; Feb. 1932, pages 63-65; Mar. 1932, pages 97-98; Vol. 7, No. 1, 1932, pages 47-54, 57-58.

General discussion of the chemistry of the open-hearth process. Deals with chemical properties of Fe and its oxides; sources of Fe oxides; Si and SiO_2; Mn and MnO; deoxidation by means of Mn; P and P_2O_5; S and sources of S; C, CO and CO_2; and effect of P on steel. Advocates high residual Mn. MS (12a)

How Metal Castings Are to be Deoxidized. (Wie muss der Metallguss desoxydiert werden?) R. Berger. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 144-145.

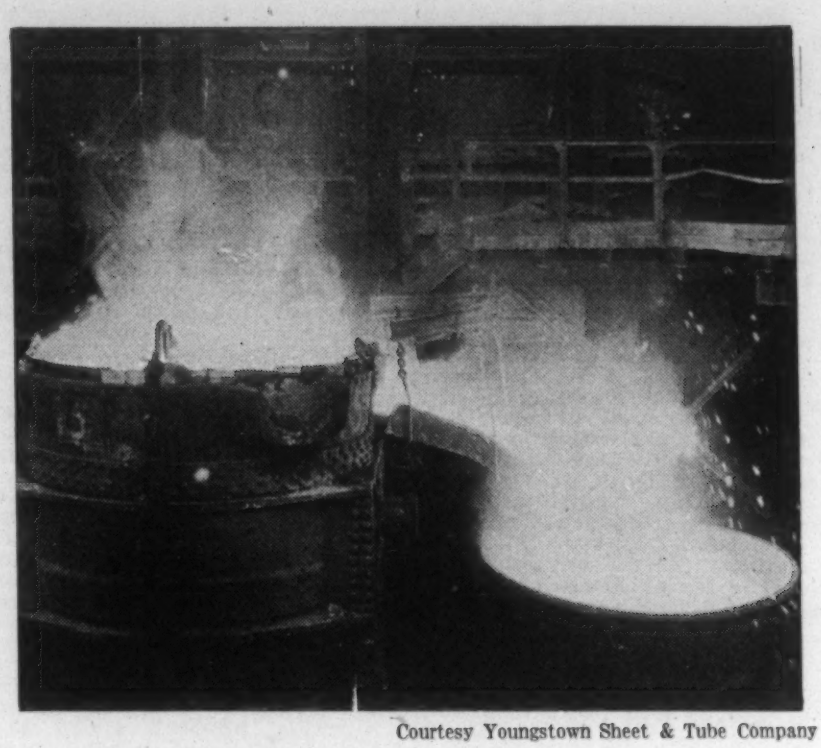
It is emphasized that in deoxidizing metal melts it is of extreme importance to submerge the deoxidizing metal under the surface of the melt when a careful deoxidation is to be attained. Suitable methods of submerging the deoxidizer are described. Submerging bells made of cast iron are excellent. The handling of such bells is outlined. GN (12a)

Notes on the Heredity Phenomenon due to the Introduction of Steel Turnings and Means to Obviate these Inconveniences. (Considerations sur les Phenomenes d'Heredite dus a l'Introduction de Robbons d'Acier et sur les Moyens d'obvier a ces Inconveniants.) M. Boutigny. *Revue de Fonderie Moderne,* Vol. 26, Feb. 25, 1932, pages 57-60.

The author deals with the differences which are often observed in the quality of steel produced in exactly the same manner, in the same furnace and of the same constituents. The principal reason is found in the scrap added to the charge, and especially if the scrap contains turnings from machining of steel pieces. The nature of the scrap should, therefore, be very well known and its amount with respect to the new material determined accordingly in order to obtain a material of the quality desired. Several examples illustrate the procedure; the ratio of scrap to new material is calculated from the chemical analysis. For the melting of such charges the rotary furnace is very advantageous, especially in smaller sizes shorter melting times and greater flexibility for different conditions are obtainable. Ha (12a)

Electric Furnaces for Melting of Metals and for the Production of Ferro-Alloys. (Elektroöfen zum Schmelzen von Metallen und zur Herstellung von Ferrolegierungen.) Reinhold Gross. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Apr. 9, 1932, pages 353-358.

The paper reviews the principal lines of progress of arc furnaces and low and high frequency furnaces, some new installations are described and energy consumptions tabulated for melting of steel and Ni. The present trend is not only to use larger furnace units but the quality and economy have progressed so much that they are used almost exclusively for ferro-alloys and chemico-thermal processes. Ha (12a)



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NIAGARA
BRAND
FERRO-ALLOYS

FERRO-SILICON
ALL GRADES

FERRO-CHROMIUM
HIGH CARBON

FERRO-CHROMIUM
LOW CARBON

FERRO-MANGANESE

SILICO-MANGANESE

PITTSBURGH
METALLURGICAL CO., Inc.
NIAGARA FALLS, N. Y.

Casting & Solidification (12b)

Comments on Press Casting. HARVEY A. ANDERSON. *Metals & Alloys,* Vol. 3, Feb. 1932, pages 28, 46.

The writer comments on the article of Pack and recounts the success of his company in maintaining composition and desirable properties in die castings. WLC (12b)

Permanent Mold Foundry Practice for Bronze Castings. HENRI MARIUS. *Transactions & Bulletin American Foundrymen's Associations,* Vol. 2, Oct. 1931, pages 393-422.

See *Metals & Alloys,* Vol. 2, July 1931, page 135. CHL (12b)

The Solidification and Crystallisation of Steel Ingots: the Influence of the Casting Temperature and the Undercooling Capacity of the Steel. B. MATUSCHKA. *Engineering,* Vol. 132, Oct. 16, 1931, page 484. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 73. LFM (12b)

Bottom Cast Practice. II, III. EDMUND C. BITZER. *Blast Furnace & Steel Plant,* Vol. 20, Feb. 1932, pages 175-178; Mar. 1932, pages 262-264, 267.

Most serious defect of bottom-cast ingots is cracking. Cracks can always be traced to unequal cooling conditions, the chief cause of this being a rapid pouring rate. 2 methods are available in preventing cracked ingots. One is to control cooling conditions directly by pouring the steel within particular temperature limits, and the other is to regulate the speed of pouring in such a manner as to obtain even cooling. First method depends on an accurate knowledge of the temperature of the steel and is not practical because of unreliable methods of measurement. The second may be carried out by regulating the nozzle size or by changing the number of molds per group to increase or decrease the pouring rate as desired. Unevenly heated molds will also cause cracked ingots. Tabulates tapping and casting temperatures and percentage of cracked ingots. Another table gives information on size of nozzles, pouring speed by groups and percentage of cracked ingots produced. Data indicate that for round ingots 13" and less in diam., rate of pouring should not exceed 150 lb./sec. For larger sizes, 200 lb./sec. is permissible. Part III. Another cause of cracking is deflection of the stream of metal to one side of the mold during pouring. Minor ingot defects are surface overlaps, surface blow-holes and shrinkage cavities around the sprue on the base of ingots. Inclusions must be prevented. Their principal cause is dirt in the steel runner on the furnace, in the ladle and in the runner brick. Ability to control pouring speed should be considered in ladle design. Ratio of cross-sectional area to height should be large. Oval-shaped ladles meet this requirement. Ideal nozzle is one that will enlarge at a rate which will maintain the pouring rate constant, but this is hard to realize. Curves show pouring characteristics of certain nozzles. With clay nozzles, pouring rate increases to a maximum and then diminishes. With magnesite or graphite nozzles, pouring rate drops as the head of metal in the ladle decreases. Any grade of steel can be bottom cast. Killed steel with 0.10-0.25% C gives the least trouble. Rimmed steel should have the proper amount of gas evolution when the steel is poured. Greatest danger in bottom casting small ingots of rimmed steel lies in pouring the ingots too high. Greater care is necessary in deoxidizing rimmed steel for bottom casting than for top pouring. MS (12b)

Babbitting Steel Shell Bearings. ROBERT JONES. *Foundry Trade Journal,* Vol. 46, May 26, 1932, page 329. A description of equipment for babbitting steel shell bearings. OWE (12b)

The Effect of the Ingot Temperature on the Location of Blow Holes and the Segregation of Soft Steel Ingots. (Der Einfluss der Kokillentemperatur auf die Lage der Randblasen und auf die Seigerungsverhältnisse in weichen Flussstahlbrammen.) AUG. STADELER & H. J. THEILE. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 12 pages.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 270. Ha (12b)

Improved Facing Material for Permanent Molds. (Verbesserte Anstrichmasse für Dauerformen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, page 261.

In the new facing material the ingredients such as graphite, talcum, clay, are not suspended in water but are in actual solution which condition is attained by a special process of colloidizing. It is to be used particularly for casting Al in permanent molds. The thinner the solutions the better the facing material clings to the mold. GN (12b)

The Centrifugal Casting Process as Applied to Non-Ferrous Metals and Alloys. J. E. HURST. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 88-92. The application of centrifugal casting to brasses, bronzes and Cu-Ni alloys, including Si bearing Monel metal, is described. PRK (12b)

Instructions for the Pouring of Machinery and Motor Bearings with White Metal. (Vorschriften zum Ausgiessen von Maschinen- und Motorenlagern mit Weissmetall.) C. KROEMER. *Automobiltechnische Zeitschrift,* Vol. 35, June 10, 1932, pages 284-286; *Die Werkzeugmaschine,* Vol. 36, July 31, 1932, pages 260-262.

A very good composition of a bearing metal is given as 75-83% Sn, 12-15% Sb and 3-5% Cu; no Pb must be added. Heating, method of pouring, avoidance of waste, preheating of bearing into which the metal is poured, etc., are treated. Ha+GN (12b)

Density and Hardness of Copper-Rich Alloys. (Dichte und Härte bei kupferreichen Legierungen.) G. KREBS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 1, 1932, page 186.

The effect of various cooling velocities on density and hardness of brasses and bronzes is considered. The effect of occluded oxygen on structure and mechanical properties is pointed out. GN (12b)

Ingot Molds. (Lingotieres a Jets.) DELCROISETTE. *Revue de Fonderie Moderne,* Vol. 26, June 10, 1932, pages 183-186.

The different forms of ingot molds, in one piece or composed of 2 or more, and their respective advantages are discussed. As the quality of the casting often depends on the kind of mold their composition is of importance; for small ingot molds, the addition of 30% of hematitic cast scrap is recommended, for larger ones only 25%. Several examples of 2-part and water-cooled molds are illustrated. Ha (12b)

Rolling (12c)

Modern Improvements in Refined Iron and Rod Mills. (Neuere Entwicklung der Feineisen-und Drahtwalzwerke.) ALBERT NÖLL. *Stahl und Eisen,* Vol. 52, Mar. 31, 1932, pages 305-309; Apr. 21, 1932, pages 381-389.

1 Report 93 of Rolling Mill Committee of Verein deutscher Eisenhüttenleute. After general description of refined iron mill roll and eccentric cooling beds, pits, improvements in shears, etc., author shows effect of temperature variation at beginning and end of a rod on physical properties of material. Elastic limit and tensile strength of trailing end of rod are higher, and elongation lower than leading end. Trailing end shows finer crystal structure. Diagrammatic sketches show continuous mill stands. New semi-continuous mill stand and improved old-type stands of Vereinigte Stahlwerke, A.-G., Niederrheinische Hütte, Duisburg-Hochfeld are detailed with illustrations. DTR (12c)

2 **Reducing and Widening of Tubes. (Reduzieren und Aufweiten von Röhren.)** F. OWESNEY. *Die Röhrenindustrie,* Vol. 24, Apr. 23, 1931, pages 97-98.

The advantages and disadvantages of rolling and drawing processes are compared with reference to the manufacture of tubes. During the drawing of tubes a necking is liable to occur and a new method for overcoming this trouble is sketched. EF (12c)

The Production Capacity of Merchant Mills. U. A. PETERS. *Rolling Mill Journal,* Vol. 5, May 1931, pages 347-349.

3 The author believes that the total amount of reduction from billet to final section should be considered in making capacity comparisons between mills of different types. He furnishes a table showing the number of passes and the elongations obtained in rolling various sections such as channels, I-beams, angles, etc. He gives a short discussion of the influence of the "lead," height of material, diameter of roll, temperature and speed of roll upon the flow of metals in rolling. JN (12c)

A 325 mm. Steel Rolling Mill. (Train à fers de 325 m/m de diamètre.) J. SCHOEPP. *Revue de Métallurgie,* Vol. 29, Apr. 1932, pages 221-227.

4 Structural features of a high efficiency merchant mill built for Societe anonyme des Forges de la Providence. JDG (12c)

Gray-Iron Rolls from the Basic Open-Hearth Furnace. (Graugusswalzen aus dem basischen Siemens-Martin-Ofen.) KURT HOFFMANN. *Die Giesserei,* Vol. 19, Mar. 4, 1932, pages 88-90.

5 Due to prevailing conditions it had become necessary for economic operation of an open-hearth furnace to make use of it also for producing cast-Fe which was mainly to be used for casting rolls. The charge was made up of roll scrap, ingot mold scrap, rails, pig iron and 10 to 12% ferro-silicon. The results were very satisfactory, the hearth, however, had to be repaired after each heat as it was strongly attacked by the high manganese oxide content. The rolls were cast in chill molds with a thin lining of clay and showed a dense fine grain. Their Brinell hardness was 250, and they had a very high wearing resistance which made them specially suitable as rolls in a roughing mill for a wire mill. Ha (12c)

American Rolling Mill Construction. (Eindrücke im amerikanischen Walzwerksbau.) A. KOEGEL. *Stahlbautechnik,* Supplement to *Montanistische Rundschau,* Vol. 24, Mar. 16, 1932, pages 3-5.

6 A review of the original article which appeared in *Stahl und Eisen,* Vol. 51, Nov. 26, 1931. See *Metals & Alloys,* Vol. 3, July 1932, page MA 219. GN (12c)

Electroroller With Stationary Axle. (Die Elektrorolle mit feststehender Achse.) *Demag Nachrichten,* Vol. 6, Mar. 1932, pages 1-5.

The article shows the latest development in construction of electro-rollers to be used in cooling beds of rolling mills. The advantages which individually driven electro-rollers offer in comparison with the drive by bevel gears are pointed out. The article is supplemented by many illustrations. GN (12c)

7 **Mills for Rolling Thin Sheets.** *Iron & Coal Trades Review,* Vol. 124, Jan. 8, 1932, pages 35-36.

A few German installations of 2-high and 3-high finishing stands and with lever doubler for mild steel and automatic doubler for hard steel sheets and a continuous cold mill are described. See "Improvements in Sheet Mills," *Metals & Alloys,* Vol. 3, May 1932, page MA 136. Ha (12c)

Repair of the Foundation of a Large Rolling Mill. (Eine aussergewöhnliche Leistung bei der Grundreparatur einer grossen Walzenstrasse.) *Demag Nachrichten,* Vol. 6, Mar. 1932, pages 5-9.

8 Description of the modernization of the Grey beam mill at Differdingen, Alsace-Lorraine, which was the first to roll Grey beams in Europe. GN (12c)

Rolling & Forging (12c-d)

Observations in the Forging and Rolling of Ledeburite Chromium Steels. (Beobachtung beim Schmieden und Walzen von ledeburitishen Chromstählen.) WERNER ZIELER. *Stahl und Eisen,* Vol. 52, Jan. 14, 1932, pages 38-42.

Includes 18 diagrams. In the forging and rolling of steel containing approximately 1% C and 14% Cr, such as is used in making non-rusting razor blades, difficulties arise due to
9 cracks. The tests show that the cause for these cracks may be due to the ledeburite structure component, the cast structure of which may be destroyed merely by extensive forging work. Efficient improvement in the cast structure of this steel could not be gotten in the annealing or heat treatment; however some improvement could be made after 60 hours annealing, provided the ledeburite nucleus was sufficiently destroyed in the forging operation. The working of ledeburite chromium steels should be done as much as possible below 1150° C. because this is the fusion temperature of the ledeburite eutectic and it forms after a
10 probable destruction of the cast structure. This new formation depends upon the period of time in which the steel is kept approximately at 1150° C. as well as upon the form in which the ledeburite exists. In turn, the form of ledeburite depends upon the kind of working which the steel is given. Rolling is the principal difficulty which yields deep cracks. DTR (12c-d)

Forging (12d)

Pressing and Stamping with the Drop Hammer. (Das Pressen und Prägen mit dem Fallhammer.) C. ZÜBLIN. *Die Werkzeugmaschine,* Vol. 36, June 30, 1932, pages 215-219.

The paper compares the various methods of processing articles in mass production. The fundamental differences, mode of operation, advantages and disadvantages of hydraulic presses, knee lever presses, friction presses and drop hammers are discussed. The practical use of each type is described. GN (12d)

Hot Pressings of Brass. J. D. SPEAKMAN. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 97-100.

The advantages of hot pressing of brass over castings are listed. A description of the operations involved and the presses employed is given. PRK (12d)

Gas Fired Furnaces Used in Heat Treating and Forging Stainless Steel. J. B. NEALEY. *Fuels & Furnaces,* Vol. 9, Dec. 1931, pages 1365-1368, 1390; *Heat Treating & Forging,* Vol. 18, Feb. 1932, pages 129-131.

Describes practice and equipment of the Western forge plant of the General Metals Corporation, Los Angeles, Calif. See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 275. MS (12d)

Steel Plant Forge Shop. J. R. MILLER. *Heat Treating & Forging,* Vol. 18, Apr. 1932, pages 235-236.

Discusses the size, equipment, capacity and location of a centralized steel plant forge shop employed chiefly for plant maintenance. Assumes that plant has an annual capacity of 2,500,000 tons of ingots. Forge shop will require 10,000 to 12,000 ft.^{2} floor space. It should have a 3000 lb. hammer, a 11,000 lb. hammer, two 600 lb. hammers, 10-12 hand forges, a 2" forging machine, a 3" forging machine, and 2 heat treating furnaces 6 ft. x 10 ft. and 4 ft. x 8 ft. hearth size. The shop will have an annual capacity of 2000 tons, while the average yearly demand will be about 800 tons. MS (12d)

Development of Hammer Boards. HAROLD G. IRWIN. *Heat Treating & Forging,* Vol. 18, June 1932, pages 365-366.

Experience has shown that a solid maple board gives the best service. Northwestern Pennsylvania rock or hard maple has been found to be especially adaptable for hammer boards. Author's firm has developed a treated board ("Silveroc") which will not warp when subjected to atmospheric changes and has a quicker pick-up in the rolls. It is unnecessary to burn the boards or to use fire-clay. Coating will not fuse at 450° F. MS (12d)

Modern Drop Forging. (Modernes Gesenkschmieden.) H. KAESSBERG. *Maschinenbau,* Vol. 11, Jan. 21, 1932, pages 29-32; Feb. 4, 1932, pages 52-55.

Discusses standardization, labor saving, etc. for the drop forging plant. Gives new methods for an increase in quality with a simultaneous reduction in costs. Further specialization is predicted as the necessary step to be taken to that end. RV (12d)

Heating Steel for Forging. N. L. DEUBLE. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 19-23, 30-31.

Discusses effects of time, temperature, composition of the steel and size of the piece with regard to heating of steel in ordinary box-type furnaces. Plain C steels up to 0.50 C and low alloyed steels up to 0.40 C can be heated quite rapidly in sizes under 5" square. From 5" up to 12" square they should be preheated before charging into a forge furnace at heat. Over this size they should be charged cold and brought up gradually. The cooling of forgings over 5" square, equivalent cross-section, should be controlled. Sensitive steels, comprising the higher alloy, stainless, and heat-resisting steels, should be preheated to 1400°-1600° F. before charging into the hot furnace. Large sizes should be charged into a cold furnace and brought up gradually. It is important that the forgings be cooled uniformly and slowly, preferably in a furnace. Large sizes must be furnace cooled. Finally, one must be governed by his own experience. Tabulates results of short-time hot tensile tests of the following steels: (1) 0.04% C, 0.25% Mn, 0.50% Cu and 0.08% Mo; (2) 0.15% C, 0.40% Mn, 25% Cr, 15% Ni and 2% W; and (3) S.A.E. 3140. MS (12d)

Machinery (12g)

Machining with Greatest Smoothness by Diamonds. (Feinstbearbeitung durch den Diamanten.) P. GRODZINSKI. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, June 19, 1932, page 329.

Discussion of the advantages which the diamond offers for machining surfaces with greatest smoothness. Its application in the optical and automotive industry is pointed out. GN (12g)

New Machine Tools Inspire Revisions in Marketing. *Steel,* Vol. 90, Jan. 4, 1932, pages 164-165.

The revolutionary developments in both machine design and marketing methods started by the machine tool industry in 1930 have been continued on through 1931. The year has witnessed a more general adoption of welded steel frames, antifriction bearings and hydraulic change gear devices, improvements in high speed tool steels and a wider use of cemented-carbide cutting materials. Other developments are the introduction of multiple motor drives, the wider use of conveyor handling methods, hydraulic feeds and electrical controls, the reduction of noises and shock to machinery through the use of rubber cushions, specially designed shock absorbing mountings and better workmanship, and the attainment of more flexible control of heavy machinery through the use of automatic and remote control systems. JN (12g)

A New Original Method for Producing Tools of Irregular Shapes. (Ein originelles, neues Verfahren zur Herstellung von Werkzeugen unregelmässiger Formen.) SCHLIPPE. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, Jan. 10, 1932, pages 1-4.

Treats of a new grinding method in which it is not necessary to force the piece into a specially constructed shaft to shape it. The machine used needs an expert operator, but it is simple and not expensive. It is very efficient and has a long life, and can be used for many different shapes. MAB (12g)

Drawing & Stamping (12h)

Making Pressed Steel Bodies. *Automobile Engineer,* Vol. 21, Nov. 1931, pages 511-517.

Survey of methods and materials used by the Pressed Steel Company of Great Britain in the manufacture of automobile bodies. Most of the material bought is sheet steel and all of it is tested for ductility and the character of the surface. Steels for body panels should contain: C, under 12%; Mn, 0.3-0.5%; S, under 0.045%; P, under 0.045%; Si, a trace. Describes physical tests. Properties should be: ultimate strength, 46,000-52,000 lbs./in.^{2}; yield point, 30,000-35,000 lbs./in.^{2}; percentage elongation in 8 ins., over 26%. Describes handling equipment and welding practice. RHP (12h)

Pickling (12i)

Modern Pickling—Results Achieved with Acids and Inhibitors Reviewed. O. L. THOMAS. *Iron Age,* Vol. 129, Mar. 3, 1932, page 548.

Abstract of paper read before the Hartford, Conn., chapter of the American Society for Steel Treating. Acids commonly used in pickling are: H_2SO_4, HF and HNO_3. Metal parts in pickling room should be covered with pitch or acid resistant paint. Acid consumption varies with area pickled and thickness of scale. Agitation of bath is essential. Gives solutions for high C steels. Cites advantages of using inhibitors. VSP (12i)

Pickling Additions and Removal of Waste Water in Metal Pickling Plants. (Beizzusätze und Abwässerbeseitigung in Metallbeizereien.) FREITAG. *Oberflächentechnik,* Vol. 9, May 24, 1932, pages 99-100.

Additions to the pickling solution are mainly for the purpose of removing in the pickling process not only the oxides (scale) from the metal surface without attacking the latter, but also to prevent the so-called pickling brittleness which consists in an occlusion (retaining) of the hydrogen by the metal. These additions are mostly of unknown compositions. The patent literature is briefly reviewed and the possibilities of recuperating metal salts or other valuable constituents from the plating solutions are discussed and described. Ha (12i)

Polishing & Grinding (12l)

Automatic Internal Grinder. H. L. BLOOD. *Transactions American Society of Mechanical Engineers,* Vol. 54, Feb. 15, 1932, Machine Shop Practice, pages 1-7.

Methods and machines which positively determine the size of the hole and require no gaging on the part of the operator are described. Ha (12l)

The Grinding of the Cut-out Parts of Locomotive Frames on the Stationary Schmaltz Grinding Machine. (Das Schleifen der Lokomotiv- Rahmenausschnitte auf der stationären Schmaltz'schen Rahmenbackenschleifmaschine.) RÜTER. *Glasers Annalen,* Vol. 11, Aug. 1, 1932, pages 19-23.

Description of installation and operation of the Schmaltz machine for grinding the cheek-pieces of locomotive frames in the repair shop at Schwerte, Germany. The instruments for adjusting the frames are described. Experiences in grinding materials used are reported. GN (12l)

Lap Shaft Bearings and Pins. *Abrasive Industry,* Vol. 13, Feb. 1932, pages 29-30.

A new crankshaft lapping machine has been developed for lapping simultaneously the pin and bearings of automotive crankshafts. The shaft to be lapped is rotated between a live headstock and a floating footstock center. The lapping arms, one of which is required for each pin and bearing, are equipped with telescoping reels, each carrying a roll of abrasive paper. When a lapping arm is removed from a pin or bearing these reels are indexed automatically, thus presenting a fresh, unused surface to each pin and bearing lapped. WAT (12l)

Coloring (12m)

Alumilite Process. R. W. PETTIT. *Monthly Review, American Electroplaters Society,* Vol. 19, Apr. 1932, pages 6-7.

Aluminum articles after cleaning in a hot alkaline bath are anodically treated in a bath (composition not given) at 15 amp./ft.^{2}, 12 volts, 72-80° F. for 15-45 minutes. Cooling coil and air agitation used. After the anodic treatment, the articles are immersed in a color bath for 3-10 minutes at 180° F. LCP (12m)

Black Oxidized Finishing. L. C. HUDGINS & H. A. CAMERON. *Monthly Review, American Electroplaters Society,* Vol. 19, Mar. 1932, pages 17-20.

Paper before Rochester Convention, July 1931. 2 commercially successful processes are described: (1) black color on brass, using an air-agitated bath containing 2.67 oz./gal. $CuCO_3Cu(OH)_2$ and 42.7 oz./gal. 28% NH_3, 2-4 min. immersion; (2) black color on Cu, using a solution of K_2S, 2 oz./gal. at 80° F. LCP (12m)

Sand Blasting (12n)

A Laboratory Test for the Hardness of Sandblast Sand. EMERSON P. POSTE. *Journal American Ceramic Society,* Vol. 15, May 1932, pages 110-113.

The change in fineness of a sand produced by grinding a 200-gram sample in a standard jar mill for 1 hour is taken as an indication of its durability in sandblasting. Results of laboratory tests on certain sands are compared with the change in fineness of these sands in actual sandblasting operation. The test is applied to sands known to be of inferior quality. Discussion of the results is based on the assumption that sand finer than 40-mesh has but little sandblasting value. WAT (12n)

Spinning (12p)

Spinning a Monel Metal Piston. HARRY SHAW. *American Machinist,* Vol. 76, Jan. 28, 1932, page 129.

Brief description and line illustrations of the operation. RHP (12p)

CHEMICAL ANALYSIS (14)

The Electrometric Titration of Uranium with Ceric Sulfate. DWIGHT T. EWING & MABEL WILSON. *Journal American Chemical Society,* Vol. 53, June 1931, pages 2105-2110.

When a hot acid solution of uranium sulphate is reduced in a Jones reductor and is titrated in an atmosphere of nitrogen with ceric sulphate as an oxidizing agent, 2 end points are obtained. The amount of uranium oxidized between the 2 end points corresponds exactly to the amount of uranium present. 2% H_2SO_4 gave the best results. MEH (14)

Colorimetric Determination of Molybdenum. L. H. JAMES. *Industrial & Engineering Chemistry, Analytical Edition,* Vol. 4, Jan. 15, 1932, pages 89-90.

This is essentially the method of Maag and McCollam. Butyl acetate is used in place of ether for extracting the brown coloration produced by the formation of molybdenum thiocyanate, and perchloric acid replaces the H_2SO_4. MEH (14)

The Simultaneous Determination of Hg and Halogens in Organic Compounds. (Determinazione contemporanea di mercurio e alogeni nelle sostanze organiche.) G. ILLARI. *Annali di chimica applicata,* Vol. 22, May 1932, pages 261-272.

The compound is oxidized electrolytically, using HNO_3 (1.4) with Pt electrodes, and a current of 125 v and 0.5 amps. 1 to 4 hours are required. The Hg is then determined by the usual electrolytic method, in the same cell. The evolved gases are absorbed in KOH, so that halogen may be determined by combining this solution with the liquid remaining after the electrolysis. AWC (14)

Inaccuracy in the Determination of Mercury by Direct Precipitation as Mercuric Sulfide from Acid Solution. E. P. FENIMORE & E. C. WAGNER. *Journal American Chemical Society,* Vol. 53, July 1931, pages 2453-2456.

It is claimed that an impure product is obtained when Hg is precipitated directly as the sulphide. Causes are discussed. Volhard's procedure is accurate when applied to solutions which contain the Hg salt and not much else, but presence of salts in quantity, and of iodide especially, leads also to higher results. MEH (14)

A Simple Separation of Molybdenum and Rhenium. (Eine einfache Trennung von Molybdän und Rhenium.) W. GEILMANN & F. WEIBKE. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 199, No. 4, 1931, pages 347-352.

A quantitative separation can easily be made by 8-oxychinoline, the Re is then determined by nitron in the filtrate of oxychinoline precipitate. Small amounts of Re can be separated from the principal quantity of Mo by distillation; from the distillate Re is then determined as described before. Ha (14)

Method for Electrolytic Extraction of MnO, MnS, FeS and SiO_2 Inclusions from Plain Carbon Steels. G. R. FITTERER. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 196-218.

Includes discussion. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 316. (14)

The Preparation of Pure Electrolytic Nickel. Part 3. COLIN G. FINK & F. A. ROHRMAN. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 359-369.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 184. (14)

Determination of Tin in Ferro-Tungsten and Tungsten Ores. (Zinnbestimmung in Ferrowolfram und Wolframerzen.) KARL KIEFER. *Zeitschrift für analytische Chemie,* Vol. 88, No. 7/8, 1932, pages 243-248.

The author points to the lack of a convenient method for routine determination of Sn in Fe-W or W ores which almost always carry Sn, and describes a new precipitation method for W by depositing it from an acid solution by oxidation from WO_2 to WO_3. Ha (14)

The Emission Spectrum Analysis and Its Practical Application. (Die Emissionsspektralanalyse und ihre praktische Anwendung.) H. LUCAS. *Zeiss Nachrichten,* July 1932, pages 19-25.

The paper first discusses the advantages of spectrum analysis as contrasted with chemical analysis. 3 references. GN (14)

The Titration of Copper with Sodium Sulphide and the Determination of Small Quantities of Dissolved Sulphides. (Ueber die Titrierung des Kupfers mit Schwefelnatrium und über die Aufsuchung kleiner Mengen gelöster Sulfide.) A. BORNTRAEGER. *Zeitschrift für analytische Chemie,* Vol. 87, No. 9/10, 1932, pages 342-352.

The procedure is fully described and comparisons with other methods show that for practical use this method is still the most convenient and accurate. Ha (14)

Quantitative Determination of Nickel and Cobalt Simultaneously. (Quantitative Mikrobestimmung von Nickel und Kobalt nebeneinander.) A. OKAC. *Zeitschrift für analytische Chemie,* Vol. 88, No. 11/12, 1932, pages 431-433.

Since the potential and other electrolytic conditions for the electrodeposition of Ni and Co are very closely similar both metals can be precipitated simultaneously on the cathode from a solution in suitable form. The test and the method used is described in detail; current densities of 0.5-1.0 amp./dm.^{2} were used and both metals were precipitated on a Pt wire cathode as a bright, well adhering metal. Ha (14)

The Analysis of Red Bronze and Brass. (Die Analyse von Rotguss und Messing.) O. NIEZOLDI. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 1, 1932, pages 186-187.

Description of common methods of analysis for the above alloys. GN (14)

The Determination of Small Amounts of Antimony in Copper and Its Alloys. (Zur Bestimmung kleiner Antimonmengen im Kupfer und seinen Legierungen.) W. BOEHM & W. RAETSCH. *Zeitschrift für analytische Chemie,* Vol. 88, No. 9/10, 1932, pages 321-324.

Sb in Cu alloys can usually be readily determined by precipitation with ammonia in the presence of the iron-salt after previous dissolution with HNO_3 so that the more time-consuming method of Blumenthal can be avoided. Ha (14)

Molecular Spectra and Spectroscopic Analysis. II. Identification of La. (Spettri molecolari e analisi spettroscopico. II. Sulla ricerca del La.) G. PICCARDI & A. SBERNA. *Atti della Reale Accademia dei Lincei,* Vol. 15, Jan. 3, 1932, pages 83-88.

By utilizing a molecular spectrum, instead of the atomic, it is possible to identify 0.01% of La even in the presence of Pr and other rare earths. This is possible because of the simpler spectrum obtained from the molecule as compared to the atom. AWC (14)

The Determination of Bismuth as Metal. (Zur Bestimmung des Wismuts als Metall.) E. RUPP & G. HAMANN. *Zeitschrift für analytische Chemie,* Vol. 87, No. 1/2, pages 32-35.

A modified gravimetric determination of Bi metal according to the method of Vanino is described in detail. This method gives more exact results. Ha (14)

The Determination of Iron in Aluminum. (Sulla determinazione del ferro nell'alluminio.) L. SZEGO. *Giornale di chimica industriale ed applicata,* Vol. 14, May 1932, pages 226-228.

To 2 g. of Al turnings, 25 cc. of water is added, and then successive portions of 10% NaOH, warming towards the end to obtain complete solution of the metal. Filter and wash residue with water. Dissolve the residue with about 20 cc. HCl (1:10) to dissolve the Fe and Ti. That Ti dissolves at this stage indicated that it occurs alloyed to Fe rather than Al. The Fe is then reduced with $SnCl_2$ and the determination carried out according to the Zimmerman-Reinhardt method. The Fe may also be determined iodimetrically, but the oxidation method is shorter. AWC (14)

A Rapid Method for the Determination of Silicon in Silicon Steel, Pig Iron and Cast Iron. (Eine Schnellmethode zur Bestimmung des Siliziums in Siliziumstahl, Roh-und Gusseisen.) OTTO NIEZOLDI. *Chemiker-Zeitung,* Vol. 56, May 7, 1932, pages 363-364.

7 references. An extensive trial of 5 methods was made and the following was found to be the most rapid and accurate: To a 1 g. sample in a 400 cc. beaker add 30 cc. HCl, sp. gr. 1.19, cover ,and heat over an asbestos mat over the full flame of a Bunsen burner. When the sample is in solution add 15 cc. dilute H_2SO_4, remove the cover and heat to fumes. Cool, dilute, add 5-10 cc. conc. HCl and dilute to 100 cc. with H_2O. Filter and wash 6 times. Ignite and weigh SiO_2. CEM (14)

The Determination and Separation of Rare Metals from Other Metals. (XX) The Determination of Iridium and Its Separation from Platinum and Other Metals. (Die Bestimmung und Trennung seltener Metalle von anderen Metallen. (XX) Die Bestimmung des Iridiums und seine Trennung von Platin und anderen Metallen.) LUDWIG MOSER & HEINZ HACKHOFER. *Monatshefte für Chemie,* Vol. 59, Jan. 1932, pages 44-60.

51 references. *Ir from Pt.* To the weakly acid solution of H_2PtCl_6 and $NaIrCl_6$ in 200 to 400 cc. add 1.5 to 2 g. $NaBrO_3$ and heat to 60° C. Add a slight excess of 1:10 NaBr solution and heat to boiling to precipitate greenish black $IrO_2 .X H_2O$. Cover with a glass containing a hole and boil to expel Br. The precipitation is complete when additions of $NaBrO_3$, NaBr solution produce no Br odor and no cloud. Filter and wash with hot NH_4NO_3 solution. Test filtrate by evaporating down. If a skin forms filter off and combine with first precipitate. Dry at 110° C. and heat at 160°-180° C. in a stream of H_2, cool, and ignite in a muffle furnace. If this procedure is not followed, IrO_2 is liable to explode. Then ignite the residue 15 minutes in a stream of H_2. Leach the residue several times in hot weak HNO_3 to separate from Na ions, filter, wash, dry, and ignite as before. Weigh Ir. To the filtrate add HNO_3, boil to expel Br and add $NH_4C_2H_3O_2$ and hydrazine chlorohydate solutions. Reduce and weigh Pt. *Ir from Au.* Use the same procedure as in separating from Pt, except dilute the solution to 600 cc. as $KAuCl_4$ is harder to wash out. Wash the precipitate several times with hot H_2O by decantation. Determine Au in the filtrate with hydrazine. *Ir from Pd.* Precipitate IrO_2 with $NaBrO_3$, NaBr solution as before. The precipitate contains some Pd. Filter and wash with hot H_2O. Evaporate the filtrate and filter again. Dry the precipitates at 110° C., heat in H_2 for 20 minutes at 170°-180° C., ignite, and heat again in H_2. Cool and fill the crucible one-half with 1:1 aqua regia, warm, and pour the solution into a beaker. Repeat this treatment 3 or 4 times. Filter and wash with hot weak HNO_3. Dry, heat in H_2 and ignite. Weigh Ir. Evaporate both filtrates to dryness. Dissolve the residue in hot H_2O and a few drops HCl. Add $NH_4C_2H_3O_2$ and hydrazine chlorohydrate solutions, boil, filter and wash with hot H_2O. Dry the precipitate, ignite in H_2, cool in CO_2 and weigh Pd. Wash again with hot H_2O to remove Cl ions. *Ir from Cu.* Add $NaBrO_3$, NaBr to the solution and allow the precipitate to settle. Filter and wash with hot H_2O. Evaporate the filtrate to 1/3 and add more $NaBrO_3$, NaBr. Filter, wash and heat the combined precipitates ½ hour in H_2 at 170° C. Cool and add 7% HNO_3 and heat on water bath. Decant and repeat the treatment, during which the paper decomposes. Dilute, filter and wash with hot water. Heat the residue at 170° C. in H_2, cool, ignite first in a covered, then in an open crucible. Cool and weigh Ir. Add HNO_3 to the filtrate, evaporate to fumes with H_2SO_4 and electrolyze Cu. *Ir from Fe.* To the weakly acid solution containing Na_2IrCl_6 and $FeCl_3$ add an excess of oxalic acid and boil gently until the reddish brown color of $IrCl_6$ has disappeared and the solution turns yellow. Pass H_2S into the hot solution, then add an excess of NH_4OH. Filter and wash with water containing $(NH_4)_2S$ and $(NH_4)_2SO_3$. Dissolve the precipitate in dilute HNO_3 and repeat the precipitation. Ignite the FeS in a stream of H_2 and H_2S and weigh as FeS. Evaporate the combined filtrates to dryness, add $(NH_4)_2S$, evaporate and repeat. To the residue add H_2O and NH_4NO_3 and filter. The filtrate must be colorless, not yellow. Dry the residue of Ir_2S_3, heat slowly in a covered crucible to red heat, cool to 100° C., uncover and ignite in H_2. Wash with H_2O, ignite in H_2 and weigh Ir. CEM (14)

Rapid Method for Determination of Sulfur in Brass and Bronze. J. O. COONEY. *Industrial & Engineering Chemistry, Analytical Edition,* Vol. 4, Jan. 15, 1932, page 33. Method consists in dissolving sample in cupric ammonium chloride and precipitating sulphur as sulphide, filtering, oxidizing to sulphate and precipitating as barium sulphate. MEH (14)

ECONOMIC (16)

Mine Production of Gold, Silver, Copper, Lead and Zinc in Oregon in 1931, by Counties. VICTOR C. HEIKES. *United States Bureau of Mines, Mineral Market Reports.* No. M.M.S. 132, July 14, 1932, 1 page.

Oregon's total productions for 1931 (and 1930) were: Au 15,350.10 oz. (14,401.34 oz.); Ag 7,254 oz. (9,000 oz.); Cu 1,700 lbs. (176,300 lbs.); Pb 3.497 lbs. (9,113 lbs.); Zn ..... (12,528 lbs.); total value $319,703 ($325,143). AHE (16)

Mine Production of Gold, Silver, Copper, Lead and Zinc in New Mexico in 1931, by Counties. CHAS. W. HENDERSON. *United States Bureau of Mines, Mineral Market Report* No. M.M.S. 147, Aug. 23, 1932, 2 pages.

Production of Au, Ag, Cu, Pb and Zn in New Mexico in 1931 (and in 1930) was Au $644,160 ($669,156), Ag 1,041,859 oz. (1,107,335 oz.), Cu 61,503,100 lbs. (65,150,000 lbs.), Pb 22,537,000 lbs. (20,756,900 lbs.), Zn 55,732,000 (65,529,000 lbs.), and value $9,494,766 ($13,748,217). AHE (16)

Mine Production of Gold, Silver, Copper, Lead, and Zinc in Nevada in 1931, by Counties. VICTOR C. HEIKES. *United States Bureau of Mines, Mineral Market Reports.* No. M.M.S. 133, July 15, 1932, 1 page.

Nevada's total productions for 1931 (and 1930) were: Au 142,293.76 oz. (149,064.47 oz.); Ag 2,562,071 oz. (4,219,832 oz.); Cu 72,634,497 lbs. (109,203,512 lbs.); Pb 15,860,634 lbs. (23,058,381 lbs.); Zn 20,861,348 lbs. (29,168,117 lbs.); total value $11,673,787 ($21,455,517). AHE (16)

Production of Gold, Silver, Copper, Lead, and Zinc in California in 1931, by Counties. VICTOR C. HEIKES. *United States Bureau of Mines, Mineral Market Reports.* No. M.M.S. 124, July 20, 1932, 2 pages.

Total production of Au, Ag, Cu, Pb and Zn in California in 1931 (and in 1930) was Au 523,135.09 oz. (457,199.98 oz.), Ag 867,818 oz. (1,622,803 oz.), Cu 12,931,995 lbs. (27,285,272 lbs.), Pb 3,757,256 lbs. (3,559,564 lbs.), Zn 159,865 lbs. and total value $12,387,734 ($13,801,004). AHE (16)

Tungsten in 1930. FRANK L. HESS. *Mineral Resources of the United States, United States Bureau of Mines,* 1930, Part 1, Jan. 9, 1932, pages 179-207.

Sales of W concentrates produced in the United States again dropped in 1930, amounting to an equivalent of 702 short tons carrying 60% WO_3, as compared with 830 tons in 1929. 58 references appearing in 1930 are given. AHE (16)

Canadian Facilities for Handling British Steel. T. M. HUTCHISON. *Iron & Steel of Canada,* Vol. 15, May 1932, pages 57-58.

An article emphasizing the prompt mill service of certain Scottish steel mills and its possible effect upon the economics of the steel trade in Canada. OWE (16)

Bauxite and Aluminum in 1930. C. E. JULIHN. *Mineral Resources of the United States, United States Bureau of Mines,* 1930, Part 1, Dec. 14, 1931, pages 151-178.

World production of Al in 1930 decreased only about 3% from 1929, while bauxite production was off 15 to 20%. In the U. S. Al production (114,518 short tons) increased 2% in quantity and decreased 2% in value. Domestic bauxite output (330,612 long tons) decreased 9.6% (15% in value) but supplies increased nearly 4% as imports increased and exports decreased. Consumption of Al in automobiles and aircraft decreased, but its use for truck and bus bodies, strong Al alloys, electrical conductors and Al paint increased. 60 references. AHE (16)

Mine Production of Gold, Silver, Copper, Lead and Zinc in Washington in 1931, by Counties. C. N. GERRY. *United States Bureau of Mines, Mineral Market Reports.* No. M.M.S. 134, July 15, 1932, 1 page.

Washington's total productions for 1931 (and 1930) were: Au 2,904.19 oz. (4,244.81 oz.); Ag 22,410 oz. (32,816 oz.); Cu 202,503 lbs. (1,206,438 lbs.); Pb 2,771,116 lbs. (1,152,585 lbs.); Zn 9,947,495 lbs. (703,782 lbs.); total value $565,498 ($348,630). AHE (16)

Need for Reducing Materials Handling Costs is Impetus to Mechanization. *Steel.* Vol. 90, Jan. 4, 1932, page 167.

The use of mechanical conveying equipment expedites deliveries, enlarges the capacity of the plant, and reduces production costs. During 1931 car dumpers, cranes, hoists, trucks, tractors, and all types of conveyors have been redesigned and improved. The use of antifriction bearings, automatic control, simpler designs, and better and lighter materials has resulted in more exact speeds and in better coördination. Newer applications of mechanization are seen in the manufacture of spiral welded pipe, the fabrication of structural shapes, and the handling of sheets, plates and coils. JN (16)

Cadmium Industry in 1931—Summary. H. M. MEYER. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 112, May 24, 1932, 1 page.

Production of metallic Cd in 1931 amounted to 1,050,529 lbs., 38% of 1930 output and 23% of the 1930 value. Sales decreased only 7% in quantity but 44% in value. AHE (16)

The British Steel Industry. H. STANLEY JEVONS. Isaac Pitman & Sons, New York, 1932. Paper, 5½ x 8½ inches, 31 pages. Price 1 sh.

The author discusses the present status of the British Steel Industry and suggests a remedy. (16)-B-

Copper in 1931. EDWARD HODGE ROBIE. *Mining Journal,* Annual Review No., Feb. 13, 1932, page 4.

Cu had its worst year in 1931. Producers stocks increased to about 800,000 tons. AHE (16)

The Production of Gold and Other Metals. *Journal Society of Chemical Industry,* Vol. 51, Apr. 29, 1932, page 374.

The following data on the production of metals, taken from a speech delivered by Sir Robert Hadfield of Hadfield's Ltd. at the annual meeting on Mar. 31, are graphically presented.

Metal	Period	Output in long tons	Value
Gold	1493-1931	32,700	£ 5,100 millions
Silver	1493-1931	397,000	2,900
Copper	1800-1931	39,500,000	2,200
Iron	1800-1931	2,895,000,000	16,000
Coal	1800-1931	52,000,000,000	39,000

VVK (16)

If Gold Should Cease to be "Gold." STEPHEN LEACOCK. *Canadian Mining & Metallurgical Bulletin* No. 244, Aug. 1932, pages 430-439.

The effect of universal demonetization of Au would be to destroy the value of Au as a commodity. AHE (16)

Silver Consumption in the Arts and Industries of the United States in 1930 and 1931. CHARLES WHITE MERRILL. *United States Bureau of Mines, Information Circular* 6647, July 1932, 7 pages.

The total consumption of Ag in the arts and industries in 1931 was 23,578,955 oz. (23,981,164 oz. in 1930; 28,601,311 oz. in 1929; 25,826,554 oz. in 1928). The ratio of scrap returned to smelters and refiners to total turnover has increased progressively from 30.6% in 1928 to 33.1% in 1931. Percentage consumption in 1931 by various industries was: Sterling Ag 37.4%; photographic 27.9%; electroplating 9.8%; jewelry, optical goods and novelties 8.8%; chemical 6.2%; industrial (including solders) 4.2%; dental 2.8%; miscellaneous 1.5%; and loss 0.4%. Comparative figures for 1928, 1929 and 1930 are given. Sterling Ag industry used only 76% as much Ag in 1930 as in 1929, but showed marked recovery in 1931. AHE (16)

The Iron and Steel Industry in the United States. E. D. MCCALLUM. P. S. King & Son, Ltd., London, 1931. Cloth, 5¾ x 8¾ inches, 33 pages. Price 12s. 6d.

This book permits us to obtain a view of ourselves through the eyes of a foreigner equipped to see truly and report accurately. During 1927-1929 McCallum was in the United States as occupant of a Rockefeller fellowship in social sciences and during this time he gathered the material for his book. To American readers the value of the book will lie not so much in the subject matter, as most of it is well known in the United States and has been covered in domestic publications. The approach of this author and his conclusions, though, are of the greatest interest, furnishing a viewpoint devoid of the patriotic pride almost inseparable from a similar narrative by an American and especially one in the steel industry. The few errors which appear detract little from the value of the work, except as setting up a few misstatements which will cause possible confusion in the future. (16) -B-

By-product Sulphuric Acid at Copper and Zinc Plants in 1931. H. M. MEYER. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 140, Aug. 5, 1932, 1 page.

The output of by-product H_2SO_4 in 1931 (and 1930) at Cu plants was 436,111 tons (651,702 tons) and at Zn plants was 426,618 tons (536,614 tons). At Zn plants 100,956 tons (125,740 tons) of S was used to supplement the roaster gases to produce 381,216 tons (474,092 tons) of H_2SO_4. AHE (16)

British Steel for the Canadian Market. J. L. PIGGOTT. *Iron & Steel of Canada,* Vol. 15, May 1932, pages 56-57.

An article by the manager of the British Steel Export Association, in which attention is directed among other things to the policy of British exporters in attempting to provide heavy sections and plates not made in Canada for Canadian users. OWE (16)

The Canadian Copper Industry in 1931. R. E. PHELAN. *Mining & Metallurgy,* Vol. 13, Feb. 1932, pages 94-95.

While 1931 was a most important year in Canadian Cu smelting and refining, due to low prices and inability of the International Nickel Company to market its capacity of Ni, the production of Cu and Ni was less than total installed capacity. VSP (16)

Nickel Resources, Production and Utilization. E. S. MOORE. *Preprint, American Institute Mining & Metallurgical Engineers,* Feb. 1932, 13 pages.

Canada and New Caledon are the only countries that produce large quantities of Ni. The Sudbury field in Canada is now the principal producer. In 1930 it produced 90% of the world's output. Prior to 1918 the chief use of Ni was in ordnance, but since the War many new uses were developed. The production for 1930 exceeded that of any previous year. The price of electrolytic Ni has been fixed during the past 5 years. JLG (16)

The Tin Industry. S. HECKSTALL SMITH. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 59-60.

Descriptions are given of the governmental control of 95% of the total world's production of Sn, and of the international Tin Pool which does not sell unless the spot price of tin is £165 a ton. A small export duty on Sn supplies funds for a 5 year program of research and development work. PRK (16)

Future of the Drop Forging Industry. C. H. SMITH. *Heat Treating & Forging,* Vol. 18, Mar. 1932, pages 174-177.

Paper presented before the Cleveland chapter, American Society for Steel Treating, Mar. 1932. Discusses the necessity of price stabilization, which is one of the most serious problems facing the drop forging industry. Better knowledge of costs will aid in overcoming the evil of price cutting. Deals with the survey of the industry being made by the U. S. Department of Commerce, importance of trade associations in relation to business, research and safety. MS (16)

A Survey of the Copper Position. E. BALIOL SCOTT. *Mining Journal,* Vol. 177, June 18, 1932, pages 415-416.

The effect of the American tariff on the Cu industry is discussed, together with other features of Cu trade. AHE (16)

Japanese Iron and Steel Industry. JAMES A. RABBITT. *Steel,* Vol. 90, Mar. 7, 1932, pages 31-34.

The production of pig-Fe in Japan increased 225% and steel 400% between 1920 and 1930. These industries have advanced in direct proportion to the country's general economic growth. The lack of home supplies of coking coal and Fe ore has been overcome by development of deposits in the colonies and by arrangements with Manchuria and the Malay States. Fe ore reserves in Japan are estimated at 40 to 80 million tons, Korea 20 to 30 million tons, and South Manchuria 300 to 750 million tons. The Government, itself, produces about 1/3 of the annual output of pig-Fe and steel. Individual enterprise by private works is encouraged by substantial exemptions from taxes. Production costs are somewhat higher than in the U. S. Fuel costs favor the electric furnace method for the reduction of scrap. The use of alloys has not kept pace with scientific progress. JN (16)

Arsenic, Bismuth, Selenium and Tellurium in 1931—Advance Summary. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 137, July 27, 1932, 1 page.

Production of As as As_2O_3 in the U. S. in 1931 was 17,137 short tons of which 14,482 tons were refined. The entire output was a by-product from smelting Cu and Pb ores. Se output amounted to 185,307 lbs. (454,769 lbs. in 1930). Sales increased 5% over 1930. AHE (30)

Steel on Great Lakes. A Half Century of Development. *Steel,* Vol. 90, Mar. 21, 1932, page 20.

The ONOKO, launched in 1882, was the first iron freighter to carry ore on the Great Lakes. Since then the size of iron ships has increased from 3,000 tons capacity to 14,000 tons and shipments of iron ore from 2½ million tons annually to 51 million tons. A total of 1½ billion tons of ore has been shipped since 1882. Ore prices today average about half the 1882 figures. The ore reserves in Minnesota are estimated at 42 billion tons. JN (16)

Metal Statistics, 1932. American Metal Market, New York, 1932. 25th Annual Edition. Cloth, 4 x 6 inches, 504 pages. Price $2.00.

The 1932 edition of this compact book contains statistics on ferrous and non-ferrous metals for 1931 and preceding years. Tables showing the production, consumption, average prices, exports, imports, etc., are given. (16)-B-

Coke and By-Products in 1931. *American Gas Journal,* Vol. 137, July 1932, page 35. Statistical review of the coke industry for the year 1931. CBJ (16)

The Engineering Outlook. I. Economic Retrospect and Prospects for 1932. *Engineering,* Vol. 133, Jan. 1, 1932, pages 17-18.

Monthly iron and steel consumption figures are given for the years 1924 to 1931 inclusive. Production index figures are given for the same years using 1924 as the base figure. LFM (16)

Molybdenum Industry in 1931. *Iron & Coal Trades Review,* Vol. 124, Apr. 29, 1932, page 711.

A brief review of the world's production in 1931. 2 American companies, in Colorado and New Mexico, respectively, and 1 Norwegian company produced all but 2%. About 3000 tons of concentrates containing 5,221,000 lbs. of MoS_2 were produced at the mines. Ha (16)

Tin World Statistics 1932. Anglo-Oriental Mining Corp., Ltd., London, 1932. Cloth, 4 x 6¾ inches, 137 pages.

This book contains tabulated statistics on the production, consumption and stocks of tin. Tables show the history of price changes. (16)-B-

Towards Cheaper Steel. Becker Coke Ovens at Scunthorpe: First British Installation to be Heated by Blast Furnace Gas. *Gas World,* Vol. 97, Aug. 6, 1932, Coking Section, pages 14-18; *Gas Journal,* Vol. 199, July 20, 1932, pages 149-153.

In an attempt to reduce operating costs to maintain its existence in the depression and to face foreign competition, the most fruitful field for investigation for the steel-making industry is the more efficient utilization of fuel available in the various processes of Fe and steel manufacture. By the installation of the plant described in the article, the company is able to produce a coke of such strength, uniformity of size, and combustibility that the whole of the production down to ¾" in size can be used in the blast furnaces, and yet less coke is required per ton of pig Fe produced. The coke oven gas produced, of high thermal value, is more efficient in the steelworks than is any other type of fuel. So nice a balance is obtained between the total heat produced and that used in the manufacture of coke, pig Fe and steel, that no fuel of any description is required other than the coal charged into the coke ovens. The reduction effected more than justifies the capital expenditure. The heating system, regenerators, battery control, coke discharging plant, quenching and screening operations, Lodge-Cottrell detarrers, ammonia saturators and acid separators, sulphate drying and bagging and the ammoniacal liquor, tar and acid services are described. MAB (16)

Industrializing Russia. *Metallurgia,* Vol. 6, Aug. 1932, pages 107-110.

Describes construction on Dnieper river. A large Al-reduction plant and steel mill are being constructed near the dam. JLG (16)

How can the Over-production of Arsenic be used? (Wie lässt sich die Überproduktion von Arsen unterbringen?) *Die Metallbörse,* Vol. 22, May 18, 1932, page 627.

The world's production of As is traced from pre-war times till now. Although the consumption increased from 10,000 tons to 50,000 tons since 1913, there is an overproduction since the discovery of large deposits in Sweden in 1926. The American natural resources and production figures are presented and the use of As and As compounds are discussed in full detail. EF (16)

A Survey of the British Iron and Steel Industry 1913-1929 and 1930-31. Wm. A. Bone. *Journal Society of Chemical Industry,* Vol. 51, Apr. 8, 1932, pages 311-315.

Comparison of Fe and steel production in 1913, 1929, and 1930-31 to the effect that an increased tariff would not increase production, that British practice is the more expensive open hearth process as opposed to the basic Bessemer process in use on the Continent and that obsolescent plants should be replaced. VVK (16)

The Metal Year 1931. (Das Metalljahr 1931.) A. Marcus. *Die Metallbörse,* Vol. 22, Jan. 2, 1932, pages 1-2; Jan. 6, 1932, page 20; Jan. 9, 1932, page 36; Jan. 16, 1932, page 68; Jan. 20, 1932; pages 84-85; Jan. 23, 1932, page 100; Jan. 27, 1932, page 116; Feb. 3, 1932, page 149; Feb. 13, 1932, page 196.

In the introduction, the economical changes and events on the world's market, which also affected the metal trade, are summarized with reference to the year 1931. Next the development of the Cu-market is traced, mainly based on information of the American Bureau of Metal Statistics. The domestic Cu consumption as well as the export figures are compiled covering the last decade. The Cu-production and stock in the U. S. A., England and France is graphically presented for the first 9 months of 1931, and the sales in the most important places, London, Hamburg and Berlin, are reviewed. The writer also discusses the developments in the Sn, Pb and Zn market with particular emphasis on production, consumption and prices of the metals. EF (16)

Production of Gold, Silver, Copper, Lead and Zinc in Idaho in 1931, by Counties. C. N. Gerry. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 141, Aug. 9, 1932, 2 pages.

Production of Au, Ag, Cu, Pb and Zn in Idaho in 1931 (and 1930) was: Au 18,361.36 oz. (21,445.7 oz.), Ag 7,220,923 oz. (9,420,639 oz.), Cu 1,144,915 lbs. (3,111,555 lbs.), Pb 198,729,228 lbs. (268,115,963 lbs.), Zn 39,137,212 lbs. (75,298,172 lbs.) and total value $11,418,013 $21,494,867). AHE (16)

Aluminum Industry in 1931—Advance Summary. H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 128, June 29, 1932, 2 pages.

177,544,000 lbs. of new Al valued at $37,284,000 was produced in the U. S. in 1931 (229,035,000 lbs., $50,961,000 in 1930). Imports of Al metal, scrap and alloy were 14,664,195 lbs., a decrease of 42% from 1930. Imports which increased were as follows: plates, sheets, bars, etc. 168,612 lbs. (248%); bronze powder and powdered foil 591,684 lbs. (27%); foil less than 0.006" thick 1,070,119 lbs. (44%); hollow ware 117,649 lbs. (14%). Exports of Al ingots, scrap and alloys were 1,510,688 lbs., an increase of 149% over 1930. Exports of plates, sheets, bars, etc. decreased 81% to 3,190,190 lbs.; exports of tubes, moldings, castings and other shapes were 1,292,400 lbs., 31% less than 1930; the value of table, kitchen, etc. utensils exported decreased 31% and that of other Al manufactures 55%. AHE (16)

Platinum and Allied Metals in 1931—Advance Final Summary. H. W. Davis. *United States Bureau of Mines Mineral Market Reports* No. M.M.S. 129, July 6, 1932, 5 pages.

The Pt refineries of the U. S. in 1931 purchased 446 oz. of crude placer Pt of domestic origin (797 oz. in 1930) and 34,933 oz. of foreign crude Pt (44,765 oz. in 1930). Domestic materials came from Calif. (353 oz.), Alaska (67 oz.), and Ore. (26 oz.),—foreign from Columbia (29,611 oz.), S. Africa (5,299 oz.), Canada (22 oz.) and Russia (1 oz.). Refined Pt metals recovered (new) in 1931 were Pt 31,274 oz., Pd 2,742 oz., Ir 1,732 oz., osmiridium 272 oz., others 185 oz. and total 36,205 oz. (43,502 oz. in 1930), of which 8,393 oz. was from domestic materials, largely Au and Ag refining. Secondary Pt metals recovered in the U. S. were Pt 33,837 oz., Pd 6,331 oz., Ir 1,823 oz., others 1,743 oz. and total 43,734 oz. (47,316 oz. in 1930). In 1931, 91,718 oz. of metallic Pt was imported ($2,589,941), Ir 1,773 oz., osmiridium 4,877 oz., Os 960 oz., Pd 28,070 oz., Rh 1,629 oz., Ru 595 oz. and total 129,622 oz. The consumption by industries in 1930 and 1931, respectively, was as follows: Chemical 13%, 11%; electrical 16%, 26%; dental 23%, 17%; jewelry 43%, 39%; and miscellaneous 5%, 7%. AHE (16)

Recovery of Metals from Secondary Sources in 1931—Advance Summary. J. P. Dunlop. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 146, Aug. 19, 1932, 4 pages.

The value of nonferrous metals recovered from secondary sources ($110,674,600) (as reported to the Bureau of Mines) decreased 43% from 1930; 21% in total quantity. The main decrease was in Cu (value $47,502,000) and brass (value $17,-932,000), 50% in value and 27% in quantity. There was a decrease of 9% in secondary Pb reported by smelters treating ore and bullion and a decrease of 22% in output of Pb in alloys reported by smelters treating scrap and drosses (value of both, $17,367,800). Zn recovered by redistillation decreased about 13,200 tons (value + alloys other than brass $3,207,200) and the Zn recovered in scrap brass was less. Detinning plants treated 27,600 tons less clean Sn plate clippings in 1931 than in 1930. About 66% of the recoveries was as $SnCl_4$ (69% in 1930). Prices were too low to treat old Sn-coated containers. Details are given for Cu, Pb, Zn, Sb, Sn and Ni. AHE (16)

Mineral Production of the United States in 1931—Advance Summary. M. B. Clark & E. T. Shuey. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 145, Aug. 19, 1932, 5 pages.

In 1931, the value of mineral products in the U. S. was $3,180,000,000, a drop of 33% from 1930. The value of metallic products ($567,200,000) declined 42%. Notable decreases in value, 44-54%, were recorded for Cu, Fe, Ag, Pb and Zn. Value of Au production increased 5%. W ore (60% concentrates) doubled in output and almost doubled in value. Hg increased in output and decreased only slightly in value. Chromite and Ni (both small outputs) increased. All other metallic products decreased. Output of nonmetallic mineral products declined 31% and mineral fuels 32%. AHE (16)

The Cost of Dust in the Steel Foundry. Clarence B. Bartlett. *Paper* before the *Steel Founders' Society,* New York, May 1932, 16 pages.

A survey of the dust conditions in large industrial plants in general and steel foundries in particular is made in its bearing on the health of the workmen, labor turnover, efficiency, etc. and on the compensation and insurance payments. The stand taken by insurance companies on professional diseases, particularly "silicosis" in foundries, by different states are reviewed and concerted action is recommended in the prevention of dust. An outline for such action is suggested. Ha (16)

Lead in the Depression. Clinton H. Crane. *Mining & Metallurgy,* Vol. 13, Feb. 1932, pages 91-94.

U. S. production of Pb for 1931 was about 400,000 tons. This is the smallest production since 1911 and 1912, but in spite of this, stocks increased nearly 50,000 tons. Estimate of production outside of U. S. was 1,120,000 tons. Curtailment in domestic production has been due to price. Pb content of scrap battery receipts by secondary and primary smelters was 140,000 tons in 1931. Approximately 68% of the Pb used in batteries comes back into use. Therefore only 4,000 tons of new Pb for batteries was needed. Gives table comparing consumption of Pb in U. S. in recent years with 1913. VSP (16)

The German Iron and Steel Foundries in the Light of Government Statistics. (Die deutschen Eisen- und Stahlgiessereien im Lichte der amtlichen Statistik.) Adolph von Buelow. *Die Giesserei,* Vol. 19, June 10, 1932, pages 230-235.

Total production, quantity, value, average value per ton, charges, amount of raw material and refined material, cost of material and labor, scrap and distribution of consumption are statistically compiled for the years 1911-1913 and 1924-1931. Ha (16)

PLANTS & LABORATORIES (17)

Mines Branch Radium Plant. W. M. Goodwin. *Canadian Mining Journal,* Vol. 53, June 1932, pages 253-255.
A brief description of the Government Experimental plant for Ra extraction from Great Bear Lake ores. WHB (17)

Eaton Axle Company. R. P. Brown. *Heat Treating & Forging,* Vol. 18, Mar. 1932, pages 197-199.
Description of heat treating practice and equipment in the axle and gear plant in Cleveland. MS (17)

Otis Steel Company. Charles Longenecker. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 89-100.
Illustrated description of the equipment of the Company with special reference to the Riverside plant. Comprises 100 Semet-Solvay coke-ovens, 2 blast furnaces, eight 150-ton open-hearth furnaces, 13 soaking pits, 40" blooming-mill, 2 continuous heating furnaces, 72" and 20" hot strip mills, 72" cold strip mill, sheet mills and an 84" plate mill. MS (17)

Pretoria (Africa) a New Center of the Steel Industry. [Pretoria (Afrika) ein neuer Mittelpunkt der Eisenindustrie.] Kurt Guthmann. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Aug. 14, 1932, pages 427-428.
Blast furnace, stoves and the electric gas purification plant, system Lurgi, of the Pretoria steel plant are described and compared with that of the new German blast furnace plant at Huckingen. The Pretoria plant is to start operation by July 1933. The new plant is expected to compete successfully with the European steel imported into South Africa. GN (17)

A Model Metal Coating Research Laboratory. E. F. Berry. *Metal Industry,* N. Y., Vol. 30, June 1932, pages 229-230.
A description is given of the new quarters of the Udylite Process Company. PRK (17)

Hansell-Elcock Company. J. B. Nealey. *Heat Treating & Forging,* Vol. 18, Apr. 1932, pages 263-264.
Description of a combination core-baking and mold-drying oven installed in the foundry of the Hansell-Elcock Co., Chicago. MS (17)

New Reversible Ingot and Bloom Mill Trains. (Neue Umkehr-Block- und -Brammen Strassen.) Fritz Münker. *Stahl und Eisen,* Vol. 52, June 23, 1932, pages 601-606.
The reversible ingot and bloom mills at the Fenderie and Gross-Moyenvre Works of Les Petits Fils de F^ois de Wendel & Cie are illustrated and described. DTR (17)

Canada Backs Research with $3,000,000 Building. E. G. Wilson. *Power,* Vol. 75, June 7, 1932, pages 837-840.
The new laboratory building of the National Research Council of Canada is described. AHE (17)

Aluminum Melting in the Electric Furnace. Wirt S. Scott. *Heat Treating & Forging,* Vol. 17, Nov. 1931, pages 1055-1058.
Practically the same as an article published in *Foundry,* Vol. 59, Oct. 1, 1931, pages 67-68. It contains an additional log of power consumption and operating costs for coke and gas furnaces. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 76. MS (17)

The Laboratories of the Ore Dressing and Metallurgical Division, Mines Branch, Department of Mines, Ottawa. C. S. Parsons. *Canadian Mining & Metallurgical Bulletin* No. 241, May 1932, pages 249-251.
Discussion. See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 47. AHE (17)

New Beam Mill Rolls Wide Flange Structural Shapes. *Steel,* Vol. 90, Mar. 21, 1932, pages 31-33, 40.
A description of the new wide flange beam mill at the South Chicago, Ind., works of the Illinois Steel Co., including control and driving equipment, soaking pits, roughing and intermediate mills, transfer equipment, etc. JN (17)

Continuous Plate and Strip Sheet Mill now in Operation. *Steel,* Vol. 90, Mar. 28, 1932, pages 31-33; *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, pages 268-269.
A description of the new plate and strip mill recently constructed for the Inland Steel Co. at Indiana Harbor, Ind. JN + MS (17)

The Foundry Institute of the Technical Hochschule in Aachen. (Das Giesserei-Institut der Technischen Hochschule in Aachen.) *Stahl und Eisen,* Vol. 52, July 7, 1932, pages 664-665.
Diagrammatic sketch is given of the new metallurgical section of the Foundry Institute of the Technische Hochschule in Aachen, Germany. Location of the 25 experimental foundry furnaces, machines, etc., is designated in the 25 m. x 18 m. hall. DTR (17)

Open-Hearth Facilities Expanded. *Steel,* Vol. 90, Feb. 29, 1932, pages 23-25.
The Illinois Steel Co. has erected 7 new basic open-hearth furnaces at their Gary, Ind., works and 21 at their South Chicago, Ind., works. This brings the total number of basic units owned by the company in the Chicago district to 95 with an annual ingot production of 9,230,000 tons. The two sets of furnace installations and their accessory units are described. JN (17)

A Modern Ingot Mould Foundry. *Foundry Trade Journal,* Vol. 46, Apr. 21, 1932, pages 245-247.
An article dealing with the works of the Fullwood Foundry Company, Limited, Mossend, Scotland. OWE (17)

Continuous Manufacture of Welded Tube. *Iron & Coal Trades Review,* Vol. 124, June 3, 1932, page 918.
A detailed description of the manufacture of welded pipe from skelp to the finished and galvanized product in the plant of the Fretz-Moon Tube Co., Butler, Pa., is given. The skelp moves from 150 to 225 ft./min., according to the thickness which varies from 0.065" to 0.154" and the width from 1 9/32" to 9 1/4". The continuous feature is obtained by using coiled skelp in lengths from 300 to 1500 ft. and welding one coil to the next; the pipe is butt-welded. The galvanizing pot is top-fired. Ha (17)

Present State of Construction of the Russion Steel Plant Kusnetskstroy. (Stand der Arbeiten an dem russischen Hüttenwerk Kusnetskstroy.) *Die Metallbörse,* Vol. 20, Jan. 2, 1932, page 9.
Reviews the projected Siberian Steel Plant Kusnetskstroy with emphasis on its capacity and presents data on the present output of this plant. EF (17)

MACHINERY & SUPPLIES (18)

Grading by Sifting of Grainy Material; Study of Modern Grading Apparatus. (Note sur le Calibrage des Matieres Minerales Grenues; Etude de quelques Appareils Cribleurs Modernes.) F. J. Pirlot. *Revue Universelle des Mines,* Series 8, Vol. 7, Feb. 15, 1932, pages 136-190.
A very comprehensive review is given of the principles of grading of materials by separating the different grain sizes and freeing it from the dust. An analytical treatment of the practical determination of the average size of a grain is developed and apparatus described which has been developed according to these principles. 20 references. Ha (18)

The Design and Application of Cranes to Steel Mill Service. Part III. G. W. Yanney. *Rolling Mill Journal,* Vol. 5, May 1931, pages 359-362.
A discussion of the advantages obtained by the use of the internal expanding type of hydraulic brakes developed for steel mill crane service from the automobile field. The advantages claimed are complete assembly in the machine shop, ease of adjustment in the field, the use of closer clearances, ready accessibility, greater ease of operation, ready equalizing of brake pressures, compactness of design and added safety. JN (18)

Conveying in Foundries. (Das Transportwesen im Giessereibetriebe.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 139-141.
It is shown how a good system of transportation increases the production, decreases the expenses for unproductive wages, and promotes an all-around efficiency in foundries. The great advantage of electric auxiliary equipment, as electric cars, electric hoists, etc. is emphasized. GN (18)

Savings Due to Electrodes of Natural Graphite. Correspondence from F. Giolitti. *Metal Progress,* Vol. 21, Mar. 1932, pages 68-69.
Lists properties of natural graphite electrodes now being manufactured in Italy. These electrodes are 15-20% cheaper than graphitized electrodes. WLC (18)

New Drilling Machine for the Bearings of Locomotive Axles. (Neues Bohrwerk für Lokomotivachslager.) W. Pilz. *Glasers Annalen,* Vol. 110, Apr. 15, 1932, pages 73-75.
Detailed description including operation of a new drilling machine for drilling the bearings of locomotive axles. The machine is built by Vulkanhammer-Maschinenfabrik, Berlin—Neukoeln, Germany.

Wire Straightening and Cutting Machine (Draht- Richt- und Abschneidemaschinen). *Stahl und Eisen,* Vol. 52, Jan. 14, 1932, page 43.
A new machine for straightening and cutting wire is described briefly. The machine is built by the Deutsche Maschinenfabrik, Duisburg. GN (18)

Recent Developments in Molding Machines in Germany. H. Illies. *Iron & Steel Industry & British Foundryman,* Vol. 5, Mar. 1932, pages 223-227.
Description of various manual and mechanical molding machines. CHL (18)

The S I P Accuracy-Coordinate Drilling Machine. (Die S I P Genauigkeits-Koordinatenbohrmaschine.) H. Kitzerow. *Zeitschrift für wirtschaftliche Fertigung,* Apr. 1932, pages 46-48.
A new unique machine tool is described which combines a measuring apparatus of highest accuracy with an efficient drilling machine. GN (18)

Leipzig Spring Fair 1932. (Leipziger Frühjahrsmesse 1932.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Apr. 3, 1932, pages 133-134.
This is a brief resumé on new foundry equipment exhibited at the 1932 Leipzig Spring Fair. There are mentioned: Sand dressing machines, grinding machines, annealing pots, melting furnaces, die and press casting machines, material testing machines, temperature measuring apparatus and other foundry equipment. GN (18)

Charging Cranes and Machines. (Beschickkrane und Beschickmaschinen für waagerechte Ofenbeschickung.) *Demag Nachrichten,* Vol. 6, Mar. 1932, pages 9-13; *Demag News,* Vol. 6, Mar. 1932, pages C9-C13.
Illustrated description of new constructions of charging cranes and machines for open hearth and rolling mill furnaces. Ha + GN (18)

A Novel Core-Shop Tool. *Foundry Trade Journal,* Vol. 46, Mar. 3, 1932, pages 141, 144.
A description of the foundry of Messrs. Newman, Hender and Company, Woodchester, England. Particular attention is paid in this article to an air-operated core-box vise, which has recently been designed and placed on the market. OWE (18)

Possibilities for Development of Steam Turbines. (Entwicklungsmöglichkeiten im Dampfturbinenbau.) W. Kaiser. *Maschinenbaukonstrukteur-Betriebstechnik,* Vol. 64, Aug. 10, 1931, pages 170-172.
The article is a general discussion of steam turbines and their future with regard to feed pipes, transition to higher steam temperatures, the influence of the size of machines on cost of installation, increasing the factors of safety in operation by careful construction and knowledge of properties of the materials, limits for efficiency, improvements, superheating, and 2-phase operation. MAB (18)

Improves Ladle Stoppers by Drying in Vertical Oven. L. F. Reinartz. *Steel,* Vol. 90, Feb. 22, 1932, pages 23-24.
A description of the new vertical drying oven and transferring equipment installed in the open-hearth department of the Middletown, O., plant of the American Rolling Mill Co. for drying and handling newly built ladle stoppers while keeping them in a permanently vertical position. JN (18)

Air Brake on Machine Tools. L. J. Berkeley. *Machinery,* Vol. 38, Mar. 1932, pages 481-485.
Describes and illustrates air operated brakes which permit instantaneous stopping of machine tools. By using reversing type motors the rotation of the tool on drilling or milling machines and the rotation of the work on lathes, can be immediately reversed. Taps may be removed by the same methods. Another feature described is a means of maintaining constant tension on the belts. RHP (18)

BIBLIOGRAPHIES (19)

Chromium Plating Literature (V). L. H. Decke. *Brass World,* Vol. 28, June 1932, pages 118-119.

This installment continues the review of the literature on anodes for Cr plating. WHB (19)

Progress in Foundry Practice for First Half 1931. (Fortschritte im Giessereiwesen im ersten Halbjahr 1931.) Hans Jungbluth & Paul A. Heller. *Stahl und Eisen,* Vol. 52, Mar. 24, 1932, pages 289-294; Mar. 31, 1932, pages 313-315.

Bibliography of iron foundry work for 1st half 1931, containing 106 references. Subdivided into following headings: (1) Composition & properties of cast iron; (2) melting; (3) molding & dressing; (4) general practice. The gist of each article is summarized. DTR (19)

Beryllium, A Bibliography. Mary E. Hoyt & Karl Von Den Steinen. *Colorado School of Mines Quarterly,* Vol. 26, Oct. 1931, 35 pages.

A bibliography of several hundred references on Be which is classified according to the following headings: (1) History and Development, (2) Ores, Sources, Distribution in Nature, (3) Chemical and Physical Properties, (4) Determination, (5) Extraction and Production, (6) Alloys, (7) Marketing and Consumption, (8) Books, (9) Patents, Foreign and Domestic. WAT (19)

Bibliography of Aeronautics, 1930. National Advisory Committee for Aeronautics. Government Printing Office, Washington, D. C., 1932. Paper, 7 x 10¼ in., 261 pages. Price 50 cents.

The Bibliography of Aeronautics for 1930 covers the aeronautical literature published from January 1 to December 31, 1930. The first Bibliography of Aeronautics was published by the Smithsonian Institution as Volume 55 of the Smithsonian Miscellaneous Collections and covered the material published prior to June 30, 1909. Supplementary volumes of the Bibliography of Aeronautics for the subsequent years have been published by the National Advisory Committee for Aeronautics.

As in previous volumes, citations of the publications of all nations are included in the languages in which these publications originally appeared. The arrangement is in dictionary form with author and subject entry, and one alphabetical arrangement. Detail in the matter of subject reference has been omitted on account of the cost of presentation but an attempt has been made to give sufficient cross reference for research in special lines. (19) -B-

Research on Steam Boilers and on Machines Producing and Consuming Heat and Power. (Forschungsarbeiten über Dampfkessel, Wärmekraft- und Wärmearbeitsmaschinen.) A. Loschge. *Forschung auf dem Gebiete des Ingenieurwesens,* Vol. 2, Dec. 1931, pages 447-453.

Gives a very comprehensive review of the research done from 1901 to 1930 as published in 97 different papers on steam boilers and power plants for production and consumption of heat. It shows the development of and the influence of scientific research on heating plants. MAB (19)

Chemistry of Iron and Steel, October to December 1931. (Beitrage zur Eisenhütten chemie, Oktober bis Dezember 1931.) A. Stadeler. *Stahl und Eisen,* Vol. 52, Apr. 7, 1932, pages 347-349.

Bibliography of literature on iron and steel chemistry, Oct. to Dec. 1931, containing 16 references. Summary of work for each article is given under following sub-divisions: (1) Apparatus and equipment; (2) pig iron, steel, ores, slags, fluxes, refractories, etc.; (3) metals and alloys; (4) fuels, gases, oils, etc. DTR (19)

Bibliography on Au-Hg Alloys. (Schrifttum über das System Gold-Quecksilber.) I. N. Plaksin. *Zeitschrift für Metallkunde,* Vol. 24, Mar. 1932, page 56.

20 references are given. RFM (19)

Progress in Coke During 1931. (Fortschritte im Kokereiwesen im Jahre 1931.) W. Melzer. *Stahl und Eisen,* Vol. 52, Apr. 14, 1932, pages 367-370.

Bibliography of progress in coke and coke industry for 1931, containing 51 references, with brief summary of each article. DTR (19)

Review of Iron and Steel Literature for 1931. E. H. McClelland. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 75-79; Feb. 1932, pages 184-185.

15th annual classified list of the more important books, serials and trade publications during the year with a few of earlier date, not previously announced. The list has been reprinted by the Carnegie Library of Pittsburgh and may be obtained free at the Library or for 5 cents, post-paid. MS (19)

Progress in the Plating Technique. (Fortschritte in der Galvanotechnik.) H. Kurrein. *Oberflächentechnik,* Vol. 9, May 24, 1932, pages 97-99.

In the field of modern electroplating technique 3 main directions of endeavor can be distinguished. (1) To determine by research work the conditions for obtaining high class work. (2) To facilitate economy in operation by improving apparatus, baths and methods. (3) To create new fields of application. These fields are reviewed singly with regard to Cd, Zn, Cu, Ni, Cr, Sn, Pb, rare metals and non-metallic protective coatings for Al. The patent literature and 93 other bibliographic references are cited. Ha (19)

The Determination of Oxygen in Iron Alloys by the Hydrogen-Reduction Method. (Ein Beitrag zur Frage der Sauerstoffbestimmung in Eisenlegierungen nach dem Wasserstoff-Reductionsverfahren.) Herbert Petersen. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 14 pages.

The difficulties of the exact determination of O in Fe alloys and the various methods are critically discussed. In order to take into account the CO which is developed by applying the H-reduction method, the CH_4 synthesis according to Sabatier and Senderens was employed which consists in a reduction of the CO to CH_4 and H_2O by means of a finely distributed 10% thorium oxide containing Ni catalyzer at 250° C. The theory of this method is derived, its accuracy determined and the apparatus used in it described. The advantages of this method are compared with the new hot-extraction method. 178 references. Ha (19)

MISCELLANEOUS (20)

The Temperature Coefficient of the Thermal Decomposition of Ammonia on Platinum. J. K. Dixon. *Journal American Chemical Society,* Vol. 53, June 1931, pages 2071-2074.

1 The decomposition of ammonia on Pt gauze has been studied between temperatures 772 and 858° C. The heat of activation of the reaction is in agreement with the values obtained for a number of other metals. MEH (20)

Investigations of Equilibrium in Reducing, Oxidizing and Carburizing of Iron. X. (Gleichgewichtsuntersuchungen über die Reduktions-, Oxydations- und Kohlungsvorgänge beim Eisen. X.) R. Schenck, Th. Dingmann, P. H. Kirscht & A. Kortengraeber. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, May 18, 1932, pages 73-96.

2 The conditions under which reduction, oxidation and carburization of thin Fe films can take place are described and compared with the results of other investigators. Ha (20)

Investigations of Equilibrium in Reducing, Oxidizing and Carburizing of Iron. XI. (Gleichgewichtsuntersuchungen über die Reduktions-, Oxydations- und Kohlungsvorgänge beim Eisen. XI.) R. Schenck, H. Franz & A. Laymann. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, June 1, 1932, pages 129-151.

3 The influence of the oxides of Si, Ti and P on the reduction equilibrium was investigated in order to elucidate the conditions when the oxides of Fe can form, with the added oxides, either solid solutions or chemical compounds. The results are reproduced in tables and diagrams to which the reader is referred. In an appendix, the action of Cr_2O_3 is described; the reducibility of Cr_2O_3 and also of its mixtures with small amounts of Fe is much lower than that of other oxides. Ha (20)

The Compression Stresses of Clamped Rectangular Plates. (Die Knickspannungen von eingespannten rechteckigen Platten.) Ferd. Schleicher. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, Dec. 1931, pages 186-193.

4 The theoretical analysis shows that the clamping on the edges is of essential influence only for approximately square plates. Diagrams are given. Ha (20)

The Mechanics of Plastic Bodies. (Mechanik deformierbarer Körper). K. Weissenberg. *Forschung, Zeitschrift Technische Mechanik und Thermodynamik,* Vol. 3, Jan./Feb. 1932, pages 51-52.

Brief discussion of the theories which play a role in the plasticity of matter. GN (20)

On Stability Problems of Thin Cylindrical Shells. (Über Stabilitätsprobleme dünner, kreiszylindrischer Schalen.) K. von Sanden & F. Tölke. *Ingenieurarchiv,* Vol. 3, Mar. 1932, pages 24-66.

5 The paper first gives a survey on previous investigations on the mechanical forces in hollow cylindrical bodies. 13 references. GN (20)

Magneto-Resistance and Magneto-Caloric Effects in Iron and Heusler Alloys. H. H. Potter. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Ser. 7, Vol. 13, Feb. 1932, pages 233-248.

Extensive research of a technical and mathematical character. RHP (20)

Determination of Stresses in Rotating Disks of Conical Profile. F. C. Rushing. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1932, Applied Mechanics, pages 91-98.

6 The accuracy of stress distribution curves obtained by the application of the theory of Donath of "sum and difference curves" as applied to rotating disks of conical profile is investigated; it is found that the calculated curves always give a somewhat higher value than that actually occurring. 4 equal subdivisions of the disk along its radius give satisfactory results. To assume only one equivalent disk of uniform thickness is admissible and satisfactory only if the speed is not too high and the taper not too large. A 2-
7 division method is developed which gives accurate results in all cases. Ha (20)

Stress Distribution in a Flank Weld Seam. (Spannungsverteilung in einer Flankenschweissnaht.) Petermann. *Stahlbau,* Supplement to *Bautechnik,* Vol. 5, June 10, 1932, pages 92-93.

The stress distribution in a continuous flank seam was found by making a limit transition from the stress distribution of the individual rivets in a rivet row. The result of the calculation is shown in a numerical example. The size of the maximum stress decreases but to a relatively small extent with increasing length of the seam. Under the conditions
8 considered the curve of the shear stresses in the flank seam is symmetrically arranged to the middle of the seam. 2 references. GN (20)

Stresses in Curved Bars. H. C. Perkins. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 201-205.

Simple formulas are developed for computing the stresses in curved bars with practically sufficient accuracy with the slide rule. A few examples are given. Ha (20)

Strength of Thin Cylindrical Shells under External Pressure. Harold E. Saunders & D. F. Windenburg. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 207-218.

9 The problem of the design of cylindrical vessels or tubes under external pressure has become of great importance in modern industrial processes, for instance, materials under a vacuum or double-walled chambers whose jackets are filled with steam under high pressure. The paper offers a theoretical treatment of questions involved in the design and tries to determine empirical constants and coefficients. Experiments were made to verify some values but it is emphatically pointed out that in the use of numerical con-
10 stants the question of geometrical and physical similarity of the bodies to be designed with those whose constants are used, is of utmost importance. A few suggestions are made on the selection of the factors of safety, and diagrams showing the relation of stresses to the physical dimensions given. Ha (20)

Improved Lighting As an Aid to Industrial Efficiency. H. LINGARD. *Foundry Trade Journal,* Vol. 46, Apr. 21, 1932, pages 250-252.

An extended abstract in which attention is drawn to the fact that only 30% of the factories investigated by the Electric Lamp Manufacturers' Association, of Great Britain, were employing modern lighting equipment, and that of that 30% only half had lighting which could be classified as good. OWE (20)

A Note on the Coefficient of Viscosity of Liquid Sodium Amalgams. G. R. PARANJPE. *Indian Journal of Physics,* Vol. 7, Part I, Apr. 1, 1932, pages 95-97.

In experiments on various sodium amalgams it was found that the viscosity decreases continually with time and that mere mechanical agitation is sufficient to regain the original value. Viscosity measurements of liquid sodium amalgams cannot be relied upon unless the time factor is kept uniform throughout the series of measurements. GN (20)

On Static and Dynamic Strain in Hoist Drums. (Über statische und dynamische Beanspruchung der Förderseilscheiben.) E. MICHAEL. *Schlägel und Eisen,* Vol. 30, June 1932, pages 132-135.

The investigation shows the importance of speed acceleration and retardation. A safe operation and economy are much more affected by alternating dynamic loads than by static loads. GN (20)

The Aachen Technical High School. J. G. PEARCE. *Foundry Trade Journal,* Vol. 46, June 2, 1932, page 343.

A brief description of the opening of a new melting shop at the above school, followed by details regarding the equipment with which this school is furnished. OWE (20)

Cesium Films on Tungsten. IRVING LANGMUIR. *Journal American Chemical Society,* Vol. 54, Mar. 1932, pages 1252-1253.

Some conclusions are drawn from J. Bradshaw Taylor's method for measuring the rates of evaporation of atoms, ions and electrons as functions of the number of adsorbed atoms per unit areas and temperature. MEH (20)

Contributions to the Data on Theoretical Metallurgy. I. The Entropies of Inorganic Substances. K. K. KELLEY. *United States Bureau of Mines, Bulletin* 350, 1932, 63 pages.

Entropies at 298.1° K. are given for those elements and compounds for whose calculation the necessary data are available. Methods of calculation are discussed. 400 references. AHE (20)

Transmission of Torque by Means of Press and Shrink Fits. J. W. BAUGHER. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 85-92.

The most important formulas for calculating the stresses occurring in press and shrink fits are presented and charts developed to readily obtain numerical results when steel shafts and cast iron or steel outer members are used. Values of coefficients of friction are derived for use in computing the probable tonnage required for a fit and the torque capacity if no key is used; formulas for tonnage and torque capacity are given. 16 references. Ha (20)

Spiral Springs. J. A. VAN DEN BROEK. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 247-263.

A theory is developed relative to the stress, strain and energy functions of spiral springs which takes into account the large deformations occurring in the action of large springs. The theory leads to the suggestion that springs should be loaded in such manner that all locally overstressed points as well as all friction between leaves are eliminated so that no grease or graphite need be employed and the efficiency of the springs thereby considerably increased. Ha (20)

The Calculation of Uniformly Loaded Rectangular Plates which are Supported by Elastic Beams at 2 Opposite Edges. (Die Berechnung rechteckiger, gleichförmig belasteter Platten, die an zwei gegenüberliegenden Rändern durch elastische Träger unterstützt sind.) E. MÜLLER. *Ingenieurarchiv,* Vol. 2, Jan. 1932, pages 606-621.

The calculations were carried on according to a method described by Nadai. Die elastischen Platten, page 120; Julius Springer, Berlin, 1925. GN (20)

Stresses in Dished Heads of Pressure Vessels. CYRIL O. RHYS. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Petroleum Mechanical Engineering, pages 49-65.

A theory of the bending stresses of heads for double-radius head profiles and a method for obtaining the profile of least stress for given diameter and depth of head are developed and the theoretical and experimental results compared. The procedure of calculation is outlined. The results of tests are given which were made over several years with large drums of high internal pressure; the bending stresses are more critical than the meridional-loop stresses. Ha (20)

Testing Materials Society Committees Revise Standards and Plan Work. *Steel,* Vol. 90, Mar. 21, 1932, page 40.

Notes on the reports of various committees and subcommittees at the Annual Meeting of Committees of the American Society for Testing Materials, held in Cleveland, Mar. 7-11, 1932. JN (20)

Method for Processing Acid-Proof Cement. (Verfahren zur Herstellung säurefester Kittmassen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Aug. 14, 1932, page 433.

Amorphous or crystallized pulverized Si is used according to a patent of the German Dye Trust. The cement is acid-proof except against HF. GN (20)

Worm Reduction Gear Lubrication. *Lubrication,* Vol. 19, June 1932, pages 67-72.

Discusses the point of view in selecting the proper lubricant for worm gears. Ha (20)

High-Temperature Bearing Service Lubrication Requirements. *Lubrication,* Vol. 19, June 1932, pages 61-67.

The means of lubricating bearings which have to operate under temperatures up to 350° F. are discussed; antifriction bearings and pressure lubrication with a heavy oil of a viscosity varying from 300 to 500 seconds Saybolt (or 60 to 170 at 210° F.) is usually applied. Several examples, taken especially from the paper making industry are described. Ha (20)

A New Protected Metal. *Metalcraft,* Vol. 8, Mar. 1932, pages 137-138.

Robertson-Bonded Metal is a laminated metal-felt material in which felted materials are cemented to steel with heat and pressure, utilizing metals as adhesives. The composite laminated material, the outer surfaces of which are suitable felts, is then saturated with any desired saturant chosen with reference to the corrosive condition to which the metal is to be exposed in service. Paint, lacquer and resin films can be used. The material can be subjected to shearing, bending, corrugating, rolling and mild drawing without destroying adhesion between felt and steel. VVK (20)

Electro-Filters for Rotating Furnaces. (Elektrofilter für Drehofen- Betriebe.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 1, 1932, page 240.

The success of the Cotrell-Möller method for separating dust from the waste gases of industrial furnaces led to the application of this electric gas purification method for rotating furnaces. In recent times the method has in particular been developed for rotating furnaces in the cement industry, the potash industry, the non-ferrous metallurgy. The latest application is to furnaces for roasting pyrite. GN (20)

The Stresses in Rotating Disks. THOS. H. FROST & K. F. WHITCOMB. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 1-11.

The results of a photo-elastic investigation are described and compared with the theory of Chree; the methods and apparatus are described; it can be stated that the results show a satisfactory and practically usable agreement between the theory of elasticity, actual grinding wheel breakage and photo-elastic experiments. Ha (20)

Strain and Change of Shape of Girder Constructions at Vibrations (Beanspruchung und Formänderung von Stabwerken bei erzwungenen Schwingungen.) S. GRADSTEIN & W. PRAGER. *Ingenieurarchiv,* Vol. 2, Jan. 1932, pages 622-650.

In this paper, for the first time, there have been calculated steel constructions from the dynamic point of view. Methods are developed for calculating the strain and deformation in a girder construction when a load is suddenly applied or lifted and for loads which, when of unvariable size, move along the construction or periodically change in size with the point of application being fixed. The paper particularly considers the case of a girder construction which is subjected to periodically alternating loads with fixed point of application. The method of calculation takes into consideration merely the transversal vibrations. 4 references. GN (20)

British and American Rolled Steel Sections. B. L. HURST. *Engineer,* Vol. 153, Feb. 5, 1932, pages 148-149.

Comments on the revised list of British Standard Channels recently published by the British Standards Institution. A table and graph are given comparing the efficiencies of British and American structural beams of various depths. LFM (20)

The Activations of Metals by Foreign Additions. II. (Ueber die Aktivierung der Metalle durch fremde Zusätze. II.) R. SCHENCK, FR. KURZEN & H. WESSELCOCK. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, June 18, 1932, pages 273-288.

The activation of metals can be influenced first, by the degree of distribution of the metal and, second, by the addition of oxides. Experiments with Fe and W showed that the formation of carbides of these 2 metals by CH_4 is made more difficult if one C atom is bound to several metal atoms in the carbides, as in Fe_3C or W_5C_2. Additions of indifferent oxides do not prevent formation of carbide if the latter consists of the same number of metal and C atoms, as in WC. Ha (20)

Distribution of Stresses in Simple Cranks. (Ueber die Spannungsverteilung in einfachen Kröpfungen.) F. ROETSCHER & J. CRUMBIEGEL. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, May 21, 1932, pages 508-509.

A theoretical analysis of the stress distribution. Near the lubrication hole of the crank the tensile stress increased 42%. Ha (20)

On the Deflection of Thin Rectangular Plates by Circular Loads. (Über die Biegung dünner rechteckiger Platten durch Kreislasten.) S. WOINOWSKY-KRIEGER. *Ingenieurarchiv,* Vol. 3, June 1932, pages 236-250.

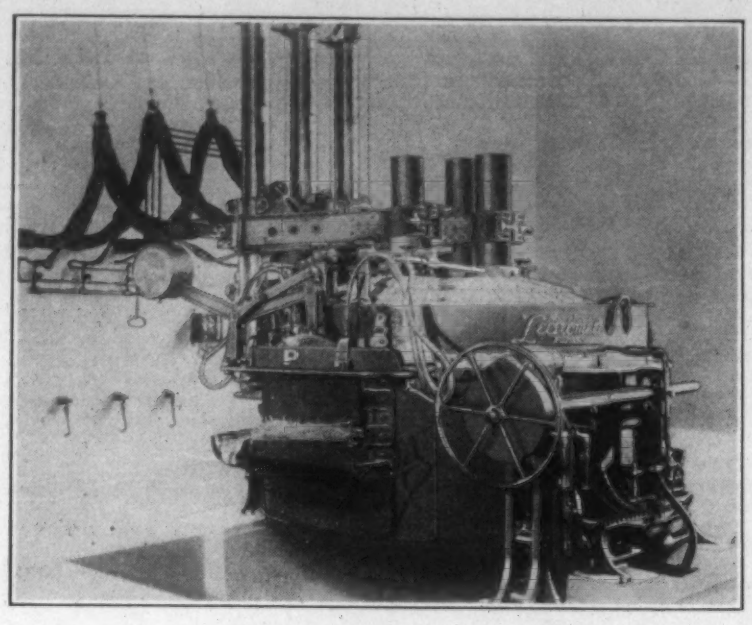
Investigations of the state of stress in plates loaded by circular loads. The previous methods of calculation by Nadai and Lewe are briefly reviewed. The author's solution of the problem is based on Kirchhoff's theory on plates. 15 references. GN (20)

Number of Order and Heat of Formation. (Ordnungszahl und Bildungswärme.) W. A. ROTH & G. BECKER. *Zeitschrift für physikalische Chemie,* Abt. A. Vol. 159, Mar. 1932, pages 1-26.

Diagrams are presented in which formation heat is plotted against order of number referring to oxides, chlorides, and chloride solutions respectively. Group 1-6 of the periodic system is included. The data refer partly to new determinations and are partly calculated from previous results which are discussed critically. A straight line relationship, which was formerly often assumed, was found in only exceptional cases. Sometimes the curves predict or prove that data picked from literature must be erroneous. Employing elements in highly pure state, the formation heat of the following oxides were redetermined in the calorimetric bomb at 20° C. and constant pressure: Ga_2O_3 = 255.8 kcal, SiO_2 = 207.8 kcal, TiO_2 = 218.7 ± 0.3 kcal, ZrO_2 = 258.1 ± 0.6 kcal, HfO_2 = 271.5 kcal, ThO_2 = 292.6 ± 1.4 kcal. Furthermore the formation heats of the following compounds were recomputed: $SiCl_4$ = 154.0 kcal, $TiCl_4$ = 185.0 kcal, ZrC = 45 kcal, ThC = — 194.79 kcal. TiC = 114 kcal. The specific gravity of Th was found to be 11.71. EF (20)

The Engineer in a Changing Society. WILLIAM E. WICKENDEN. *Electrical Engineering,* Vol. 51, July 1932, pages 465-471.

An address. Every revolutionary movement has tended to augment the engineer's sphere of social responsibility. The educators must develop men who are able to deal in a more statesmanlike manner with the major economic and social problems of a technological era. WHB (20)



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FOUNDRY PRACTICE & APPLIANCES (22)

Cause and Prevention of the Formation of Scum in Aluminum-Bronze and Special Brass. (Schaumbildung bei Aluminium-Bronze und Sondermessing, Ursache und Bekämpfung.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, pages 331-333.

Since the pronounced tendency of Al alloys to form scums is due to occurrences of oxidation, special precautions are necessary to avoid oxidation. These precautions are discussed. Of great importance is the casting procedure. Rising pouring is preferable. The proper arrangement of gates and risers as well as special devices to keep slags from the mold are discussed. The paper also refers to American practice in casting Al-bronzes and deals with the use of skim cores. The effect of the casting temperature on the formation of scums is mentioned. GN (22)

Hints for Drilling Molding Flasks and Tables of Molding Machines. (Winke zum Bohren der Formkästen und Formmaschinentische.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 29, 1932, pages 231-232; June 12, 1932, pages 250-251; June 26, 1932, page 272.

The drilling of guide holes in flasks and tables of molding machines as well as the drilling of threaded holes for screwing on patterns are dealt with. GN (22)

Mould Density Determination. Wm. Y. Buchanan. *Foundry Trade Journal,* Vol. 46, May 19, 1932, page 302.

The author discusses an example of the practical application of the penetration method of measuring the degree of ramming in molds, which has been described elsewhere. The principal of the penetration method is that a 1/8" diameter steel wire is driven into the sand by the blow of a falling weight under standard conditions. The uniformity of the degree of ramming in individual molds may be thus determined, and the case under discussion in this article is evidence in support of the author's statement. The author points out that the penetration method can be used as a check on routine production where liberties may be taken with the amount of sand used, the pressures employed, etc. The advantages of such control are: (1) the ability to check any mold at a moment's notice; (2) having determined the most suitable degree of ramming for a particular job and class of sand, this can be adjusted with certainty and checked as often as necessary; and (3) by the methods described in the article the degree of ramming of any part of a mold relative to the rest of the job can be adjusted. OWE (22)

Molding Devices which the Pattern Maker Makes. (Formeinrichtungen, die der Modellbauer ausführt.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 12, 1932, pages 248-250.

Some examples are discussed which are to show how sand molding of certain shapes is facilitated by simple devices made in the pattern shop. GN (22)

Some Aspects of Oil Engine Foundry Practice. Herbert E. Beardshaw. *Foundry Trade Journal,* Vol. 46, June 23, 1932, pages 385-389.

The author emphasizes the need for consultation between the designers of castings and the foundry, particularly when the more intricate and costly types of casting are being considered. Attention is directed to the materials used in foundry practice for types of casting manufactured in oil engine foundry practice—namely, fly-wheels, cylinder heads and blocks, and larger castings. Casting stresses receive some attention. Author's view on the testing and examination of foundry materials is given. OWE (22)

Manufacture of Acid-Proof Bronzes. (Herstellung von Säurebronzen.) R. Berger. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 1, 1932, pages 184-185.

The paper outlines the procedure to be followed in melting a bronze of high stability against HCl, H_2SO_3, Na_2SO_4, and alkaline bearing water. This bronze contains about 83.9% Cu, 8% Sn, 6% Pb, 2% Ni, .1% P. In order to attain a high corrosion resistivity it is absolutely necessary to insure the absence of Fe and Zn. Therefore, the raw materials must be carefully selected. If this bronze is melted under the precautions given the castings are dense and possess a high toughness. GN (22)

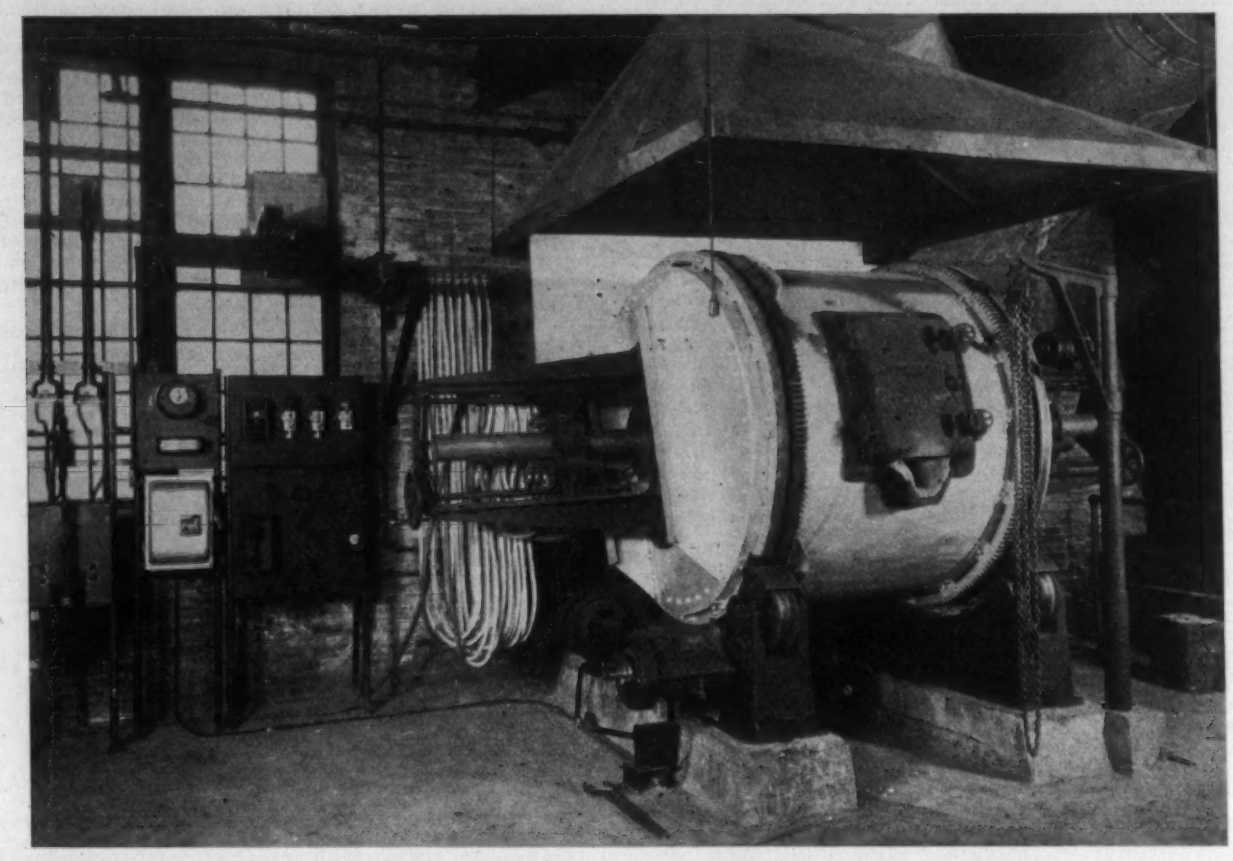
Charges with a High Content of Scrap Iron. (Eisengattierungen bei höherem Gussbruchzusatz.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 19, 1932, pages 214-215.

The paper first outlines the disadvantages of a high content of scrap Fe in the charge. They are: enrichment of the S content, increased hardness and, therefore, poor machinability, and finally increased tendency to porous castings, particularly when the scrap Fe is very rusty. The remedies are discussed: desulphurization is suitably attained in a forehearth or, if a forehearth is not available, S should be decreased by high furnace temperatures and the addition of special admixtures, composed of 2 parts of limestone and 1 part of fluorspar. 2 kg. of this mixture are used per 100 kg. of the charge. The addition of special irons containing 0.5-1.0% Si and 3-4% Mn is also advisable. The brittleness of cast Fe made from charges with a high amount of scrap Fe can be counteracted by varying the Si content:

Wall thickness of the casting in mm.	Si in the casting for 50-55% scrap	60-65% scrap
Below 10	2.6-2.8%	2.8-3.0%
10-20	2.4-2.6%	2.6-2.8%
20-30	2.2-2.4%	2.4-2.6%
30-40	2.0-2.2%	2.2-2.4%
Above 40	1.8-2.0%	2.0%

The Mn content should not be below 0.8%. In order to counteract the impairing effect of scrap Fe on the tensile properties of the Fe, steel scrap or the above special Fe should be added. To avoid the tendency to porosity the furnace should be run as hot as possible, and the Fe also cast as hot as possible. In following the above rules the price of cast Fe can be decreased by using a higher amount of scrap without impairing the quality of the Fe made. GN (22)

PRECISE CONTROL



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FURNACES & FUELS (23)

A New Electric Melting Furnace of the Induction Type. (Ein neuer Elektro-Schmelzofen nach dem Induktionsprinzip.) U. Schwedler. *Elektrowärme,* Vol. 2, Mar. 1, 1932, pages 59-62.

A new construction of an induction type furnace is described which can be used for low frequencies as they exist in distributing systems and for 3-phase current so that both the transformation into high-frequency and the lead load distribution with a single phase furnace are eliminated. The heat is produced by the eddy currents induced in the material to be melted. The winding is arranged in the same way as in an induction motor so that a rotating field exists into which the material is brought. The theory of the furnace is derived and was checked by a small experimental furnace. In order to keep the heat of the melt away from the winding water-cooled Cu pipes surround the bath. Ha (23)

A Four Ton High Frequency Induction Furnace. (Un four à induction à haute fréquence de 4 tonnes.) Dudley Wilcox. *Journal du Four Electrique,* Vol. 41, June 1932, pages 210-212.

A description is given of a new 4 ton induction furnace installed in 1931 at South Chicago Works of Illinois Steel Company. The housing of the furnace is made of steel lined with Cu. The temperature rise in it is but a few degrees. Magnesia-alumina mixture known as Almag is used successfully for lining. The furnace is fed with 12,000 amperes at 1,000 cycles produced by a motor generator set of 1,250 kwh. having 1,500 r.p.m. and located about 200 m. from the furnace. It is used largely for remelting stainless steel scrap. JDG (23)

The Coreless Induction Furnace in Modern Steel Plant Operation. (Der kernlose Induktionsofen im neuzeitlichen Stahlwerksbetrieb.) Nino Broglio. *Elektrowärme,* Vol. 2, July 1932, pages 150-156.

The characteristic properties of the coreless induction furnace are discussed. The melting crucible has a very favorable ratio of depth of bath to surface of bath for the required reaction, about 1:1.3 for a furnace with 2,000 kg. charge (5,000 kg. liquid charge). The crucible is made of any reliable heat resisting material and arranged within the Cu coil. The furnace is usually fed by a 3-phase - single phase MG-set with current of 1,200 to 1,300 volts at 2,000 cycles. Its particular advantage is its great flexibility so that it can be used for many metallurgical processes, and the high quality of the material produced. Furthermore, it works very rapidly and higher temperatures can be obtained with it than with other methods, up to 1800° C. without difficulty. As the heat is generated in the material itself and not supplied from outside the process is economical. The electrodynamic stirring of the bath (due to eddy currents) assures a great homogeneity of the melt and great uniformity of different melts. A melting schedule of a furnace for high-speed steel and a few other schedules are given in detail and compared with the open-hearth and Thomas processes. Ha (23)

Some Features of Coreless Induction Furnaces. A. D. Meyer. *Heat Treating & Forging,* Vol. 18, Apr. 1932, pages 257-259, 262.

A coreless induction furnace permits control equalled heretofore only by laboratory apparatus. Contamination of the metal is reduced to a minimum. High-alloy scrap can be remelted with practically no loss of alloys and no pick-up of contaminating materials and at practically any speed of melting desired. Gentle stirring of the bath promotes deoxidation and eliminates inclusions and segregation. D. J. Campbell has shown in *Journal Iron & Steel Institute,* Vol. 122, pages 85-94 that refining of steel in the induction furnace holds real possibilities. Several of his curves are reprinted. Duplex processes utilizing the induction furnace for final refining, deoxidation, and alloying are very promising. Linings are made of acid, basic or neutral refractories, the basic lining being favored in the United States. Acid linings are usually installed by the fused-in method, average life being about 50 heats. Both pre-fired crucibles and the fused-in method are used in basic furnace practice. Crucibles are not practical for furnaces of capacity greater than 1 ton. High-grade MgO and a suitable bond are used for crucibles. $ZrSiO_4$ is preferable for backing them. Average life of crucibles is about 90 heats for general steel melting, and is considerably longer when melting stainless steels. The induction furnace is admirably adapted to melting corrosion and heat resisting steels. Production of stainless steels with 0.04% C is easy. A total of 32,500 kw. of Ajax-Northrup furnaces has been installed up to 1932. The largest installation is a 4-ton furnace. MS (23)

Electric Furnaces in Mine Shop and Foundry. A. H. Hubbell. *Engineering & Mining Journal,* Vol. 133, Aug. 1932, pages 442-445.

The electric furnace is applied in the mining industry in 4 ways: (1) for melting scrap in foundries, (2) for heating drill steel preliminary to forging it, (3) for heat-treating or tempering drill steel bits after each forging, and for heat treating or normalizing drill steel after resharpening. WHB (23)

Comparison of Bids for Resistance Furnaces. (Vergleich von Angeboten für Widerstandsöfen.) V. Paschkis. *Elektrowärme,* Vol. 2, Mar. 1, 1932, pages 54-59.

In order to be able to make a proper comparison of bids for electric furnaces a schedule is laid out in which the principal data are brought into such relation that a basis for comparison is found. In this schedule, the required energy per unit surface and per unit volume, the radiating surface, heating-up time, stored heat, regulation of temperature, etc. are taken into account. Ha (23)

Current Leads to the Electrodes of Electric Furnaces. (Les amenées de courant aux electrodes du four electrique.) *Journal du Four Electrique,* Vol. 41, June 1932, pages 213-214.

Excellent protection of the bus bars can be obtained by inserting them into flexible steel pipes through which water is circulating, cooling the electrode holders at the same time. Practical application of this device as made by La Societe des Electrodes de la Savoie was entirely successful. JDG (23)

Calculation of Inductance and Current Distribution in Low Voltage Connections to Electric Furnaces. C. C. Levy. *Electrical Engineering,* Vol. 51, June 1932, page 406.

Formulas and methods are presented for the determination of the inductance of the relatively short connections between a transformer and an electric furnace in which the currents are very large and where the geometrical dimensions and arrangement of the conductors has to be taken into account. Practical applications of the formulas are shown by several examples. Ha (23)

Practical Study of the Operation of Electric Arc Furnaces for Alternating Current. (Etude pratique du fonctionnement des fours a arc a courant alternatif.) P. Gonnard. *L'Industrie Electrique,* Vol. 41, May 25, 1932, pages 221-227.

The theory of alternating current arc furnaces is developed and applied to practical questions such as self-regulation and the power factor for 3-phase and single phase furnaces. On account of the large currents in the conductors from transformer to furnace, attention must be paid to the manner of arranging these leads to the movable electrode and to the stationary part in order to avoid undue increase of the power factor. Ha (23)

The Theoretical Principles of the Induction Heating without Iron-Secondary Circuit. (Die theoretischen Grundlagen der Induktionsheizung ohne Eisenschluss.) W. Fischer. *Elektrowärme,* Vol. 2, Feb. 1, 1932, pages 41-43; Mar. 1, 1932, pages 67-69.

The conversion of electrical energy into heat by induction at high frequencies without the use of an Fe circuit is derived theoretically with particular regard for the heating of small pieces. The screen effect determines the depth of penetration; a table is computed giving for Cu, Fe, Pb and graphite the most favorable diameter of a piece for frequencies up to 100,000 cycles and the conductivity of the respective material. A few furnace connections are given to show the possibilities of counteracting the reactance by capacitance. Ha (23)

Electric Furnaces. (Elektrische Öfen.) W. Rohn. *Die Chemische Fabrik,* Vol. 5, Apr. 13, 1932, pages 113-116.

Advantages of electric furnaces over other methods of heating are: (1) heat is produced where it is needed and does not have to be conducted through other materials; (2) efficiency is as high as 90%; for very high temperatures, 50 to 60%; (3) the temperature produced can be made equal to that needed and does not have to be higher as in a combustion zone; (4) the control is accurate and simple. For temperatures up to 300° C. the resistance of conducting metals is used to produce the heat. For temperatures between 300° and 1200° C. the resistance of other metals which are poorer conductors is utilized. Up to 700° C. stainless steel is satisfactory, from 650° to 1050° Cr Ni alloys and from 1050° to 1200° Cr Fe Al alloys; for units subject to corrosive atmosphere Cr Ni Mo alloys. It is important to choose the correct wire diameter and not to overload the wire. For 300°, 1 mm. wire is suitable; for 600°, 2 mm.; for 800°, 4 mm.; for 1000°-1050°, 6-8 mm. The maximum load/cm.^{2} of surface area of wire is 3-4 watts for 500°, 1 watt for 900°, 0.6 watt for 1000°, 0.3 watt for 1100°. For 1250° to 1400° C. ceramic units such as Globar are used. For processes which are carried out in an atmosphere of H_2 units of Mo or W are used, which can stand temperatures up to 2100° and 2800° respectively. The ends of the units are connected with the source of the current by water cooled Cu rings. If an H_2 atmosphere cannot be used in the heating chamber, a tube is wound with Mo wire and surrounded with H_2 or methyl alcohol vapor. Graphite heating elements can be heated up to 3000° C., but it is difficult to keep the connections cool. Still higher temperatures can be obtained with the electric arc, but they cannot be regulated. For melting metals at high temperatures the induction furnace can be used. CEM (23)

Industrial Electric Furnaces for Heat-treatment, etc. (Elektrische Industrieöfen für Weiterverarbeitung.) V. Paschkis. Julius Springer, Berlin, 1932. Cloth, 6¼ x 9¼ inches, 305 pages. Price 31.50 RM.

While the author acknowledges that some features of electric resistance furnaces cannot yet be calculated on an engineering basis, yet their design has advanced in so many points beyond the cut and try basis that is is possible to present much well-established engineering data in tables, curves and nomographs. Large amounts of such data are given.

The volume is an engineering handbook of particular value to furnace designers and its study would be of value to many furnace users on account of the discussion of the factors involved in obtaining thermal efficiency and on choice of furnaces.

General design, resistance elements, refractories, insulation, pyrometers, control devices, and many details of construction are described and illustrated. The Globar type of resistor and Mo resistors are discussed. Arc and induction furnaces are not considered.

The examples and illustrations include many American as well as German furnaces. The bulk of the book deals with small batch type furnaces, but bright annealing furnaces and continuous furnaces of various types are not neglected.

It is well printed, well bound, and well indexed. H. W. Gillett (23)-B-

Induction Heating of Heat Treating Furnaces. (Le chauffage par induction des fours à traitement thermique.) V. Barut. *Journal du Four Electrique,* Vol. 41, July 1932, pages 257-260.

Close temperature regulation can be obtained in heating furnaces using the induction principle by generating the heat in the muffle itself and adjusting the composition of the metallic muffle so as to have its point of demagnetization corresponding to the desired maximum temperature. Further adjustment can be obtained by inserting into the muffle proper, slides which produce the desired changes in the amount of heat generated. Furnaces were built on this principle permitting a close and automatic regulation of quenching practice. A furnace is described in which the point of austenization is indicated. JDG (23)

Furnace Dimensions for Maximum Efficiency. (Ueber die günstigste Ausnutzung lichter Ofenabmessungen.) T. STASSINET. Doctor's thesis, 1932, Technische Hochschule Aachen. Paper, 8 x 11½ inches, 31 pages.

A mathematical study is given of proper dimensions of the interior of furnaces, such as annealing furnaces, in relation to the size, number and manner of loading the pieces to be heated. Increased efficiency of 5 to 10% is claimed in fuel fired and in electric furnaces by the use of proper dimensions and loading. Curves are given for various mathematical functions used in the calculations. The treatment is highly mathematical though based on some tests and records of practical operation over a period of years.

H. W. Gillett (23) -B-

Annealing Furnace for Malleable Iron. *Foundry Trade Journal,* Vol. 46, June 2, 1932, pages 339-340; *Iron & Coal Trades Review,* Vol. 124, May 20, 1932, pages 841-842.

A description of a Hermansen recuperative annealing furnace recently installed at the works of Messrs. Alfred H. Mould & Sons, of Walsall, England. OWE+Ha (23)

Mechanical Furnace for Annealing and Heat Treating of Ordinary and Heavy Plates. (Mechanischer Ofen zum Glühen und Vergüten von Mittel-und Grobblechen.) H. FEY. *Stahl und Eisen,* Vol. 52, June 23, 1932, page 617.

Description of mechanically-operated plate annealing furnace developed by the "OFAG," Dusseldorf, for heat treating heavy plate 8-120 mm. thick weighing up to 12 tons, charged cold or warm. Blast furnace gas with a small amount of coke-oven gas is the fuel; 450,000 Kcal/ton is needed when material is charged cold and 250,000 Kcal/ton when it is warm. Furnace is 20 m. long and 3.4 m. wide, and production runs from 20 to 30 tons/hr., cold or hot charge, respectively. DTR (23)

On Gas Flow in Pusher Furnaces. (Beitrag zur Kenntnis der Strömungsvorgänge in Stossöfen.) ADOLPH BRANDL. *Archiv für das Eisenhüttenwesen,* Vol. 5, Apr. 1932, pages 609-613.

Report of the Heat Section of the Verein deutscher Eisenhüttenleute. The velocity distribution of gases in pusher furnaces agrees thoroughly with the flow of cold gases and liquids. One of the determinations of flame loss gave unexpectedly high values (heat loss above 10%) and showed that the draft and pressure ratios must be watched carefully. The temperature measurements showed a sharp drop in the vicinity of the heating surfaces. The temperature distribution appears to be influenced principally by the cooling conditions; the use of burners on the side of the furnace would remove the cold layers and influence heat transfer favorably. The measured pressure loss due to friction checked with the approximate ratio. The Grum-Grzimailo is not an acceptable theory of the gas flow in the impulse or pusher type furnace; it is generally possible to figure on a complete filling of the furnace cross section. From the study of the draft and pressure ratios it is evident that the holding of the minimum pressure differential or drop between the inside of the furnace and the atmosphere over the entire length of the furnace (heat economy of no small importance) may be attained by the use of a diffusion-like furnace construction, or "Equal Pressure" furnace. DTR (23)

Mixed-Gas Heating for a Pressing Plant Heating Furnace. (Mischgas beheizung für einen Presswerk-Wärmofen.) W. BOETTCHER. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, Dec. 1931, pages 194-200.

The capacity and temperature of a furnace for a varied type of articles could be increased considerably by mixing the blast furnace gas which was the original fuel with Selas gas, a coke gas. The most favorable mixture is determined according to the goods to be heated; diagrams show the relations between mixtures and temperatures obtained, output increased and heat consumption. Ha (23)

Forge Furnaces Improved by Diffusion Combustion. H. M. HEYN. *Steel,* Vol. 90, Mar. 14, 1932, pages 36, 38.

Most forging difficulties due to scaling of steel may be solved by proper control of furnace temperatures and furnace atmospheres. Diffusion combustion provides this control by maintaining the gas and air currents in separate and distinct layers so that combustion proceeds only at the flame boundaries where mixing occurs. The lowermost layer of gas sweeps over the bottom and blankets the work against the effects of air and the products of combustion. As a result, the steel remains unoxidized in the furnace and the total amount of scale formed is considerably reduced. Other benefits of diffusion combustion are rapid heating rates, uniform distribution of temperature and the prevention of the dangers of overheating and burning. JN (23)

Forging Costs Reduced by use of Modern Furnaces. C. L. WEST & R. R. LA PELLE. *Heat Treating & Forging,* Vol. 18, May 1932, pages 315-318; June 1932, pages 373-375, 378.

In a plant producing a 30 lb. steering knuckle, made of SAE 1045 steel, 2 oil-fired, slot-type furnaces were replaced by an 8 ft. hearth diameter, oil-fired, rotary type forging furnace. Other equipment and conditions remained the same. In another plant producing a 45 lb. automotive forging of SAE 1030 steel, 2 large natural-gas-fired, slot-type furnaces were replaced by a gas-fired, continuous, pusher-type furnace of the V-groove hearth type. As a result of these changes fuel cost was reduced about 50%, production increased about 100%, while wages of hammer and press crews were increased. In the first case, actual savings in cost of fabrication was 37% and in second, 41%. Survey of a number of installations of continuous forging furnaces shows production has been increased 40-200%. Reasons for this increase are a continuous supply of thoroughly heated steel, without excessive localized temperatures or excessive scale; improved working conditions; delivery of material at uniform and continuous rate; elimination of overheated and burnt steel; and control of atmosphere. For heating the end of a piece of stock an automatically controlled rotary-type furnace has been developed. The entire furnace rotates. Multi-door batch-type furnaces have been developed for unusual shapes and sizes for intermittent production. A recent installation combines the advantages of the diffusion burner with the use of a non-metallic type recuperator, resulting in very low fuel consumption. MS (23)

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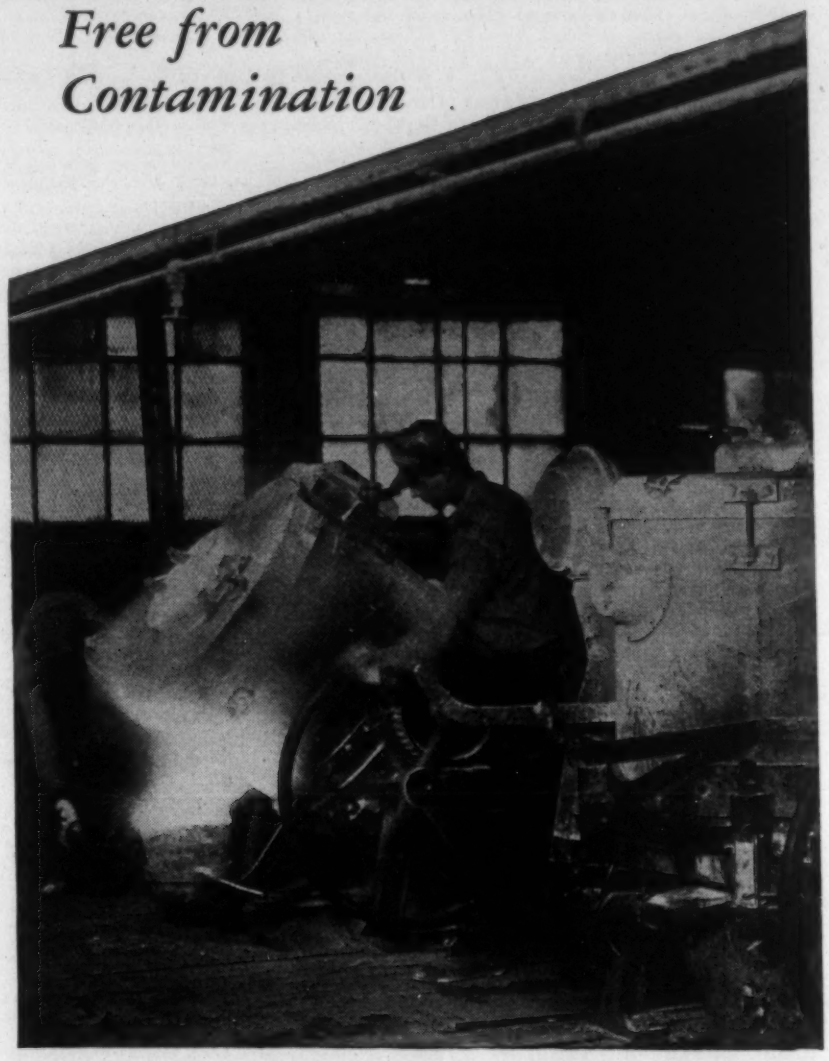

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GASES IN METALS (25)

On the Determination of Gases in Metals with Special Reference to the Determination of Oxygen in Iron and Steel by the Hot-Extraction Method. (Zur Bestimmung der Gase in Metallen, besonders des Sauerstoffs in Eisen und Stahl, nach dem Heissextraktionsverfahren.) H. DIERGARTEN. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 10 pages.

See *Metals & Alloys,* Vol. 1, Sept. 1930, page 744. Ha (25)

Synthesis of Gas-Metal Compounds by Sputtering. L. R. INGERSOLL. *Journal American Chemical Society,* Vol. 53, May 1931, pages 2008-2009.

Ni sputtered in nitrogen under special conditions gives a dark, somewhat metallic-looking film which shows on X-ray examination a crystal structure distinctly different from that of the pure metal. Compounds of Co and Fe with nitrogen have also been produced, as well as of Ni and H. MEH (25)

A Dark-blue Nickel Oxide. (Ueber ein dunkelblaues Nickeloxyd.) M. CENTNERSZWER & H. ZYSKOWICZ. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, June 18, 1932, pages 252-256.

The action of CO, air and O on Ni was investigated. While no effect on Ni-sheet could be stated in the temperature range from 50° to 150° C., Ni-powder showed a distinct change by forming a compound NiO of distinctly blue color; the color is maintained up to 290° C. when it changes into yellow-green. This oxide is soluble in organic acids by heating, but insoluble in alkalies and organic solvents. Ha (25)

The Heats of "Adsorption" of Oxygen on Nickel and Copper Catalysts. W. WALKER RUSSELL & OSBORNE C. BACON. *Journal American Chemical Society,* Vol. 54, Jan. 1932, pages 54-71.

Relatively large amounts of O are rapidly and irreversibly adsorbed on catalytically active Ni and Cu surfaces with considerable evolution of heat. A catalytically active surface, capable of again adsorbing large amounts of oxygen at 0° with only moderately reduced thermal effects, is obtained simply by heating in a suitable temperature range a surface previously poisoned by saturation with oxygen at 0°. Evidence is advanced indicating that heating causes a change of adsorbed O to stable oxide. Evaluation of the activity of Cu catalysts by reaction velocity measurements and by heats of O adsorption and adsorption capacity, indicates that definite relations exist between these properties. MEH (25)

On the Removal of Gases from Aluminium Alloys by Mixtures of Nitrogen and Volatile Chlorides. J. D. GROGAN & T. H. SCHOFIELD. *Institute of Metals, Advance Copy* No. 612, Sept. 1932, 9 pages.

Previous experiments had shown that gases can be removed from molten Al alloys by volatile chlorides. Tests with several Al alloys proved that they can also be removed by chlorides diluted with commercial N. About 0.25 cc. CCl_4/lb. of metal proved satisfactory for small melts. Tensile tests indicated that the degasified alloys had good properties. JLG (25)

Adsorption and Activation of Carbon Monoxide at Palladium Surfaces. HUGH S. TAYLOR & PAUL V. MCKINNEY. *Journal American Chemical Society,* Vol. 53, Oct. 1931, pages 3604-3624.

CO does not reduce palladium oxide and is itself a powerful inhibitor to the reduction of the oxide by H. There is no C formation and no decomposition of CO by palladium below 350° C. The determination of the effect of temperature change upon the amount of adsorption is shown to be a practical method for the investigation of the various forms of adsorption. MEH (25)

Control of the Gases Occurring in Steel. HENRY D. HIBBARD. *Iron Age,* Vol. 129, May 5, 1932, page 1018.

Control of gases in steel may be accomplished by either chemical, physical or mechanical means. The author concludes by stating that in making steel CO is unavoidable but useful, H is unavoidable but harmful, N is probably unavoidable and a hardener. Other gases, CO_2, NH_3 and perhaps others are accidental and in small quantities. Their effects, if any, are small and negligible. VSP (25)

Gases Retained in Solidified Steel or Evolved from it. HENRY D. HIBBARD. *Iron Age,* Vol. 129, Apr. 14, 1932, page 879, Adv. page 18.

Little is known of gases held in solidified steel. They are probably in solution in the metal. Most prolific yield of gas comes from metal when heated in vacuo, that is, under the smallest pressure attainable. When dissolved in acid particularly HCl and H_2SO_4 the gases evolved are (1) H, set free from acid as metal goes into combination, (2) hydrocarbons formed from decomposition of carbides of Fe and (3) any occluded N, CO_2 and CO which may be in the metal. H is manifestly the most harmful of the gases. Mn in bath metal seems to have some solvent power for CO and much more for H. VSP (25)

Thermodynamic Studies of System Iron-Carbon-Oxygen. (Thermodynamische Untersuchungen zum System Eisen-kohlenstoff-Sauerstoff.) E. SCHEIL. *Stahl und Eisen,* Vol. 52, Apr. 21, 1932, page 394.

Brief summary of recent literature on thermodynamics of system Fe-C-O. Apparatus for equilibrium studies of γ-Fe with CO-CO_2 mixtures is shown in diagrammatic sketch. Changes in weight of Fe are definitely related to C changes for constant ratio $\frac{PCO}{PCO_2}$, and are definitely related to O_2 changes for constant ratio $\frac{P^2CO}{PCO_2}$. Reactivity $A^c = \frac{P^2CO}{PCO_2} \times \frac{1}{K}$ is used, although at higher C-concentrations, solution of C does not follow laws of dilute solutions. $\frac{P^2CO}{PCO_2}$ values for C of several workers show good agreement. For C-content in γ-Fe from 0.09% to 3.0%, ratio varies from 2.6×10^3 to 70.5×10^3. Solubility of C in α-Fe at 800° C. was 0.01% C. Solubility of O_2 in γ- and α-Fe, 0.01%. Correlated results on O_2-solubilities do not show good agreement. DTR (25)

EFFECTS OF ELEMENTS ON METALS & ALLOYS (27)

Low Melting Heavy Metals in Lead Base Bearing Metals. (Über die leichtschmelzenden Schwermetalle in Blei-Lagermetallen.) K. L. ACKERMANN. *Metallwirtschaft,* Vol. 11, May 20, 1932, pages 292-293.

5 references. The addition of 5% of Sn, Hg, Bi or Cd to Pb has a hardening effect. The Brinell hardness of pure Pb is 5.7 kg./mm.^{2}, with 5% Sn added it is 9.7, with Hg 10.1, with Bi 6.7 and with Cd 19.2. 5% Ti does not alter the hardness. Additions of Hg or Bi to the eutectic alloy 82% Pb, 7% Sn, 11% Sb produce an hypoeutectic alloy, of Tl or Cd an hypereutectic alloy. Additions of Hg to Pb base bearing metals have little influence on the hardness, the elastic limit of compression is increased, but the wearing properties are lowered. Bi has no influence on the hardness of Pb base bearing metals, and decreases the hardness of those containing Ni. Tl has no practical value as an addition to bearing metals. In certain concentrations Cd increases the strength of bearing metals, but if the percentage is too high they become brittle and weaker although they are harder than similar alloys without Cd. CEM (27)

Alloy Cast Irons. GERALD S. BELL. *Iron & Steel Industry & British Foundryman,* Vol. 5, Dec. 1931, pages 151-153.

See *Metals & Alloys,* Vol. 3, May 1932, page MA 147. CHL (27)

Ferro-Alloys in the Steel Foundry. R. C. GOOD. *Steel Founder,* Vol. 3, Mar.-Apr. 1932, pages 36-38, 49.

The various ferro-alloys are briefly discussed with regard to their effect and alloying conditions. In the foundry ferro-silicon and ferro-manganese are used as scavengers, the former also as a gas solvent. The effects of Cr and some complex alloy combinations on toughness and machineability of cast steel and cast Fe are briefly described. Ha (27)

Improvement of Steel and Cast Iron by the Addition of Zirconium. (Amelioration de l'acier et de la fonte par le zirconium.) PH. GUY. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, Jan. 1932, pages 12-14.

Tests made during recent years proved the fact that Zr added as Zr-Fe-Si alloy improved the properties of cast steel and cast iron. As examples are cited 2 steels; one of 0.61% C, 0.23% Si, 0.62% Mn, 0.015% P and 0.019% S to which was added Zr. The Izod number was increased from 12 to 15.2 due to the addition of Zr. In another steel of 0.16% C, 0.23% Si, 0.65% Mn, 0.146% P and 0.047% S, the Izod number increased from 35.3 to 46 after the addition of Zr. Steels containing 0.10-0.20% Zr, after heat treatment exhibited decided improvement in ductility, resistance to shock, and increase in elasticity. Addition of Zr to white cast iron renders it gray. It is recommended to add to steel a sufficient amount of Zr to form 1/3 of the final Si. Additions of Zr to cast iron vary from 0.10 to 0.35%. GTM (27)

The Influence of Third Metals upon the Constitution of the Brasses. IV. The Influence of Aluminum. (Der Einfluss von dritten Metallen auf die Konstitution der Messinglegierungen. IV. Der Einfluss von Aluminium.) O. BAUER & M. HANSEN. *Zeitschrift für Metallkunde,* Vol. 24, Apr. 1932, pages 73-78; May 1932, pages 104-106.

The preparation of alloys, their treatment, and thermal analyses are described. Numerous sectional diagrams are given combining the results of the thermal and metallographic studies: at 1, 2, 4, 6, 7.7, 9.4% Al; also diagrams for constant Cu content 72.5, 69.8, 64.8, 60.8% Cu; for constant Zn content 15, 20, 25, 30, 35% Zn; for compositions 56.5 to 89.5% Cu and 10.5% Al, for 60 to 85% Cu and 15% Al; also ternary diagrams for the solubility limits of the α, β and γ phases at 800°, 600°, 475° and 410° C. RFM (27)

Influence of Small Additions of Foreign Elements on the Shrinkage, Impact Resistance and Hardness of Refined Zinc. (Einfluss kleiner Zusätze von Fremdstoffen auf Schwindung, Schlagfestigkeit und Härte von Raffinadezink.) O. BAUER & P. ZUNKER. *Mitteilungen der deutschen Materialprüfungsanstalten,* 1932, No. 12, pages 183-184.

Condensed. For abstract of original article see *Metals & Alloys,* Vol. 2, Sept. 1931, page 190. HWG (27)

Study of Titanium Cast Iron. (Etude des Fontes au Titane.) J. CHALLONSONNET. *L'Usine,* Vol. 41, Feb. 12, 1932, page 27.

The equilibrium diagram of Fe-Ti in the range of 0 to 2% Ti with about 2.2% C was investigated. 3 zones are distinguished: up to 0.8% Ti a white casting, from 0.8 to 1.3% mottled iron, and higher percentages gray iron. The Brinell hardness reduces in the 2 first zones from 550 to about 200 to increase again to about 300 in the third zone; the pearlite follows approximately the same course while above 1.3% Ti the casting becomes ferritic. Ti and Si which have the same chemical characteristics modify the cast iron in the same manner; both favor the formation of graphite in the solidification and later in the annealing, and both reduce the thermal hysteresis. Ha (27)

The Effect of Nickel on the Properties of Whiteheart Malleable Cast Iron (with Special Reference to "Thin-walled Malleable"). Part II. S. J. E. DANGERFIELD, F. JOHNSON AND E. R. TAYLOR. *Carnegie Scholarship Memoirs, Iron & Steel Institute;* Vol. 20, 1931, pages 65-86.

The authors report a study of the effect of Ni on the properties of whiteheart malleable where the Si is 0.53% against 0.65% in the Fe reported on in Part I, these Memoirs, Vol. 19, 1930. Ni content up to 3.23% was studied and the conclusion of Part I regarding improved fluidity, non-impairment of machining quality, and no alteration of fracture with increasing Ni were confirmed. The increase in tensile strength is confined to a shorter range reaching a maximum at 1.3% Ni from which it falls off to a very low value at 3.0% Ni. Elongation falls off with increasing Ni. Bars when sound are capable of 180° bend up 1.0% Ni. Lack of scientific control of melting and annealing operation in most malleable plants is discussed with view of pointing to the greatest need for such control. Laboratory annealing tests while not entirely satisfactory confirmed in general the results of works anneal. Reannealing resulted in a general loss of tensile strength. WLC (27)

Cadmium and Tin in Silver Solders. (Kadmium und Zinn in Silberläten.) THEWS. *Die Metallbörse,* Vol. 21, May 16, 1931, pages 918-919.

The influence exerted by Cd and Sn on the properties of Ag-solders and chemical analyses of the latter are given. EF (27)

Influence of Small Additions of Aluminum to Gray Cast Iron. (Influenza della piccole aggiunte di alluminio alla ghisa grigia per getti.) G. SIROVICH. *La Metallurgia Italiana,* Vol. 24, Feb. 1932, pages 83-98.

10 references. Fluidity spirals were cast from an iron of 3.24% total C, 2.30% Si, 1.18% P, 0.08% S, 0.42% Mn, with and without the addition of 0.03% Al. The one without Al showed greater fluidity and the cross section of the spiral was gray throughout. With Al, the surface next the sand was white, with the interior gray, the chilled surface increasing in thickness as the free end of the spiral was approached. Another test was run on iron of about 3.05% total C, 0.70 - 0.80% combined C, 2.30% Si, 1.15% P, 0.10% S, 0.36% Mn to part of which about 0.015% Al was added in two different ways. The spiral without Al ran farther than the previous iron without Al, and showed a little chill on the corners of the triangular cross section, the chill starting to appear at about half way toward the free end. A cast with about 0.015% Al thrown into the ladle as a button, and one in which the button was put in the ladle and the ladle then filled, acted alike, the length of the spiral being less than without Al (and about the same as on the 3.24% iron without Al) and the cross section showed a frame of white iron all the way, the white layer increasing in thickness as the free end was approached. The tips of the spirals cast from metal treated with Al showed a bulge, those without Al did not. The above tests were made on 25 to 40 lbs. of metal cast from a small ladle with some wait after adding the Al. In the second series the temperature dropped from 1330° C. on the first cast (no Al) to 1300° C. on the third (with Al). Another series of tests was then run, all cast at 1335° C. (a) without Al addition, (b) adding about 0.01% Al to a 1100 lb. ladle of iron by placing the Al in the cupola spout and taking out a small ladle full from the large ladle, the small ladle having been heated by dipping it in the large ladle, (c) adding the Al to the large ladle, and waiting 5 minutes before dipping out the small ladle. The spiral in (b) ran nearly as far, and in (c) farther than in (a), and only showed a trace of chill on the corners of the triangular cross section near the free end. This last series of three tests was then repeated, save that the Al was added to the large ladle and using a pouring temperature of 1320° C. Here there was no trace of chill on the Al-treated spirals and the Al-treated spirals were longer than the un-treated one. It is concluded that the addition of not over 0.01% Al and the allowance of a few minutes for the Al to act before pouring, improves the fluidity of the iron. Higher Al tends to produce chill. Photos of the spiral, macrographs of the cross sections at different points along the spiral, and micrographs of the structure are shown. See also *Metals & Alloys,* Vol. 3, June 1932, page MA 188. HWG (27)

Effect of Antimony on the Mechanical Properties of a Bearing Bronze. C. E. EGGENSCHWILER. *Bureau of Standards Journal of Research,* Vol. 8, May 1932, pages 625-634.

A study was made of the effect of additions of Sb (from 0-0.58%) upon the Brinell hardness, the structure, the Izod impact value, the deformation under pounding, and the broaching properties of a bearing bronze containing 80% Cu, 10% Sn and 10% Pb. In general, increasing the Sb content from 0-0.59% had no effect on the broaching properties nor upon the distribution of the Pb particles throughout the Cu-Sn matrix. There was a slight tendency toward an increased size of the areas of the hard δ constituent with the higher Sb content. Additions of Sb lowered the Izod impact value. The deformation under pounding was markedly lowered with the first addition of Sb, reaching a minimum at 0.2% Sb. Higher Sb additions tended to increase the deformation. The addition of Sb up to about 0.2% slightly increased the Brinell hardness of the alloy, but further additions of Sb, up to 0.58%, caused little or no further change in hardness. WAT (27)

The Influence of Small Amounts of Admixture in Metals. (Ueber den Einfluss kleiner Beimengungen in Metallen.) W. FRAENKEL. *Zeitschrift für Metallkunde,* Vol. 23, Aug. 1931, pages 221-224.

A review. The following subjects are briefly discussed: the available degrees of purity of various metals; the accuracy of analytical methods in determining small amounts of admixed elements; the effect of small amounts of admixed elements upon mechanical properties, recrystallization, electrical conductivity, diffusion, reaction velocity, corrosion; deoxidation and gases in metals. RFM (27)

Cast Irons with Higher Nickel Additions. A. B. EVEREST. *Foundry Trade Journal,* Vol. 46, Mar. 24, 1932, pages 193-194; Apr. 7, 1932, pages 217-218, 226.

In the first section of the article very complete reference is made to the subject of martensitic cast irons and heat-treatable cast irons. The effects of tempering on certain Ni alloys are dealt with in some detail. In the concluding section of the paper the physical properties of austenitic cast Fe are dealt with. OWE (27)

Catalysis and Photoconductors. F. H. CONSTABLE & A. F. H. WARD. *Transactions Faraday Society,* Vol. 28, May 1932, pages 497-508.

New results and known information are given for binary mixtures of Se with Ag; Th; Bi; Pb; Hg; Zn; Cu; Fe. Of these Fe decreases the dark resistance and light ratios (current in the light; current in the dark); Zn and Pb are indifferent in effect; Th, Bi, Cu, Hg, Ag, increase the dark resistance and light ratios. Light ratios are higher at lower annealing temperatures. The addition of any of these substances to Se does not increase the median value of light ratios for a given resistance to a higher value than would correspond to that of a pure Se film of the same dark resistance. These foreign bodies play little part in assisting or retarding the ejection or recombination of electrons under the influence of light, but they influence the chemical constitution of the crystalline light sensitive mass. PRK (27)

INSTRUMENTS & CONTROLLERS (28)

The Application of Electron Tubes in the Steel Industry. D. W. DEAN. *Iron & Steel Engineer,* Vol. 9, Mar. 1932, pages 124-128.

The types of electron tubes which have found industrial applications are the phototube, the three-element thermionic tube, and the grid-glow tubes with neon or mercury filling. Their characteristics are briefly explained and applications, especially in steel mills, as relays, controls, etc., described. The possibilities of this kind of equipment, and a list of possible further extension of its use are discussed. Ha (28)

The Settling-Elongation Meter. (Der Setzdehnungsmesser.) A. U. HUGGENBERGER. *Zeitschrift Verein Deutscher Ingenieure,* Vol. 76, Apr. 23, 1932, pages 417-418.

After the completion of a structure, changes often take place during the period of settling which it is important to supervise. An instrument is described which can be used for the continuous measurement of the elongations or deformations going on in course of time; it is similar to a lever gage. Several applications are described. Ha (28)

Optical Measurement of Fine Wire. A. C. BLACKALL. *Wire & Wire Products,* Vol. 7, July 1932, pages 230-237.

One of the difficulties of measuring very fine wires is the provisional deformation in the very process of measurement by mechanical devices. This trouble has been eliminated by an optical arrangement by which the wire is placed or drawn between a system of lenses and the diameter is read by the position of a prism. The method of calibration of the arrangement is described. The diameters as determined with the apparatus agree with the true value generally to within ± 0.00005". Ha (28)

High-Temperature Control: Photoelectric-Tube Pyrometry. LEWIS R. KOLLER. *Industrial & Engineering Chemistry,* Vol. 23, Dec. 1931, pages 1379-1381.

A photoelectric tube apparatus has been developed by means of which it is possible to control furnace temperatures from 1000° C. upwards to within 10°. An important advantage of this device is that it can be applied to high temperatures or to atmospheres which would be destructive to thermocouples or resistance thermometers. MEH (28)

Photocell Control of Temperature. W. P. KOECHEL. *Electronics,* Vol. 4, May 1932, pages 170, 182.

An arrangement of temperature control of 4 filament-coating ovens by means of a photo cell is described. Ha (28)

Temperature Measurement of Molten Cast-Iron. (Temperaturmessungen an flüssigem Gusseisen). J. MOELLER. *Die Messtechnik,* Vol. 7, Apr. 1931, pages 93-96.

After a discussion of the importance of the temperature measurement of the liquid cast-Fe the 3 principal measuring methods are described and compared: thermo-electrical pyrometer, total radiation pyrometer, partial radiation pyrometer; the latter type is considered to be the most practical. As an example of the latter the "Pyropto" of Hartmann & Braun is described. From measurements with an instrument of the latter type the following emission coefficients of Fe have been found: Fe, solid, polished, 0.45; Fe, liquid, bright, 0.40; Fe, solid, in air (below 137° C.) 0.90; Fe oxide 0.90. lead bath (slag) about 1.0; salt baths, about 0.50. These figures give the difference between the radiation of a black body and the not black body. A diagram is given from which the corrections for temperatures up to 2000° C. can be taken directly. See also *Metals & Alloys,* Vol. 3, May 1932, page MA 148. Ha (28)

The Photo-Electric "Eye" in a Steel Mill. *Machinery,* Vol. 38, Nov. 1931, page 206.

A photoelectric cell is used at the plant of the Bethlehem Steel Co., Lebanon, Pa., to actuate the mechanism for cutting the bars. When the end of the bar passes over the cell, the bars are cut. The length is varied by moving the cell. RHP (28)

Automatic Remote Gas Pressure and Volume Limit Control. *Iron & Coal Trades Review,* Vol. 124, Feb. 12, 1932, page 280.

An electro-hydraulic regulating arrangement for the distribution of a fluctuating gas supply to the various sections of a large works is described. The gas pressure on a diaphragm is held in balance by a weight and a spring acting on the levers for the control of the required gas pressure; the movement of the diaphragm in one or the other direction closes energizing circuits for electromagnets. Ha (28)

Some Notes on the Application of Direct Acting Thermostats to Industrial Appliances. *Gas World,* Industrial Gas Supplement, Vol. 96, Mar. 19, 1932, pages 17-18.

Deals with the advantage in having automatic temperature control for the various industrial processes with thermostatic control applied at very low cost. The particular applications referred to are its use in the hardening of Al where the action of the thermostat is steady and will turn off the gas before the highest temperature needed is reached, in the drying of cores in iron foundries, and in washing machines for finished castings where the hot water used in a plating shop is regulated. MAB (28)

Electrical Acidity Detector and Flow Controller. *Engineering & Mining Journal,* Vol. 133, Aug. 1932, page 426.

2 automatic signals have been developed by the electrical department of the Inspiration Copper Co. which aid in the operation and maintenance of equipment at the leaching plant. The first signals the presence of acid in the return condensate from the heat transfer division. A small electrolytic cell, operating on a.c., in the flow of the condensate from the vacuum pumps to the condensate storage tanks removes the acid. Pb electrodes are spaced with 4½" centers and a 1000-ohm Benjamin Telecode relay is connected in series to these. 1 part of acid is indicated in 1000 and the presence of acid in the condensate is indicated by signal lights, while a horn warns of exceptional acidity. A second electrical installation determines the rate of solution flow through a launder. 5 electrodes of varying lengths are suspended from a wooden holder bolted to the top of the launder and as they become immersed in the solution, circuits are established that light signal lamps at the main pump stations, indicating the various solution levels. An alarm circuit operates on the high solution level. WHB (28)

EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

The abstracts in this section are prepared in coöperation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M.

The Modulus of Elasticity of Steel at High Temperatures. E. HONEGGER. *Brown Boveri Review,* Vol. 19, July/Aug. 1932, pages 143-147.

The tests have shown that at high temperatures the modulus of elasticity is smaller the longer the time for which the load is applied. The dependence of the modulus of elasticity on the time makes it necessary to take into account in calculations the variation of the loading with time. MAB (29)

Heat Resistant Steel Containing Chromium, Nickel, Aluminum and Silicon. (Hitzebeständiger Stahl durch Legierung mit Chrom, Nickel, Aluminium und Silizium.) WILHELM OERTÉL & ALEXANDER SCHEPERS. *Stahl und Eisen,* Vol. 52, May 26, 1932, pages 511-513.

To produce a steel of fine-grained structure, highly heat resistant, and highly resistant to scale loss on ignition, increasing amounts of Ni were made to 26 different steels, containing C from 0.18 to 0.38%, and varying amounts of Cr, Si and Al. The tensile strength and elongation were determined at 700°, 900° and 1000° C., and the ignition loss at 900°, 1000°, 1100° and 1200° C., together with an examination of crystal structure. Results were tabulated and the most suitable alloy steel for the purpose contained 18% Cr, 8% Ni, 0.5 to 1.0% Al and 2 to 2.5% Si. DTR (29)

Tensile Properties of Rods and Wires at Low Temperatures. (Festigkeitsprüfungen an Stangen und Drähten bei tiefen Temperaturen.) F. PESTER. *Zeitschrift für Metallkunde,* Vol. 24, Mar. 1932, pages 67-70.

The tensile properties of bars of Cu, bronze, Al, Aldrey and steel were determined at temperatures of +20°, −20°, −60°, −77° C. Tensile curves at low temperatures are given and the changes in tensile strength, yield point, elongation and reduction in area over this range in temperature are expressed in graphs. In general the tensile strength increases with decreasing temperature, the elongation increases, and in some cases the reduction in area also increases. RFM (29)

Study of a C-Cr-Mo Steel at Room and High Temperatures. Its Overheating and the Correction of the Effects of Overheating. (Etude d'un acier au C-Cr-Mo a la temperature ordinaire et a hautes temperatures. Sa surchauffe et sa regeneration.) A. C. PRULIERE. *Revue de Métallurgie,* Vol. 29, Jan. 1932, pages 34-44; Feb. 1932, pages 93-101; Mar. 1932, pages 156-163.

43 references. A comprehensive study of a steel containing: 0.60 C, 0.40 Mn, 0.25 Si, 0.11 P, 0.004 S, 1.60 Cr, 0.22 Mo at room temperature, in the range 425°-1000° C., and after overheating. Mechanical, metallographic and physical properties were studied. Overheating can be corrected by an air quench from 950° C. following a long soaking. JDG (29)

Research on Vanadium Steels and Their Significance in Heat Technic. (Erforschung der Vanadiumstähle und ihre Bedeutung für die Wärmetechnik.) BR. SCHULZ. *Brennstoff- und Wärmetechnik,* Vol. 13, Jan. 1931, pages 7-10.

Discovery, commercial utilization and properties are briefly summed up. The influence of V on the metallography and physical properties of steels is considered at length, mainly referring to articles by Guillet, Vogel and Tammann, William and Barness, Sperling, Moldenke, Oberhoffer and coworkers, and Prömper and Pohl. The balance of the paper refers to information on the utilization of V steels for the construction of super-heater units, blades of steam and gas turbines as well as parts of water turbines. Concludes with a comparison between CrV and CrNi steels. EF (29)

Tensile Tests on Welded Rods at Elevated Temperatures. (Warmzugversuche an Schweissen.) H. A. HORN. *Zeitschrift für Schweisstechnik,* Vol. 21, Oct. 1931, pages 241-245.

Data from tensile tests at 20°, 150° and 250° C. on gas-welded and electro-welded 6 mm. rods turned from big seams of welded mild steel are given. The gas-welded test pieces proved to be decidedly superior to the electro-welded samples. The elongation decreases somewhat with rising temperatures, whereas the strength materially increased. The use of special coated electrodes in electro-welding is urged in order to improve its efficiency. In the critical discussion of the results, the importance of taking into account the properties of the transitional regions between seam and virgin metal is stressed, since the present tests refer only to the seam itself. Nevertheless, the high yield point and favorable elongation values of gas-welded seams are of primary significance in boiler construction. EF (29)

Heat Treatment of Bolts has Improved Modern Engineering Practice. F. O. KICHLINE. *Heat Treating & Forging,* Vol. 17, Nov. 1931, pages 1042-1045.

This article was published in *Iron Age,* Vol. 128, Oct. 22, 1931, pages 1058-1060 and in *Steel,* Vol. 89, Oct. 26, 1931, pages 31-33, 38. See "New Uses for Bolts Demand Higher Standards of Manufacture," *Metals & Alloys,* Vol. 3, July 1932, page MA 227. MS (29)

Japanese Discuss Many Aspects of Metal Science. Correspondence from K. HONDA, Sendai, Japan. *Metal Progress,* Vol. 21, Mar. 1932, pages 72, 92.

Mentions important paper read before Japanese Iron & Steel Institute and describes facilities of a new laboratory for study of the effect of low temperatures. WLC (29)

On the Mechanism of Breakdown of Steel. M. KURODA. *Scientific Papers Institute of Physical & Chemical Research,* Vol. 17, Dec. 1931, pages 111-123.

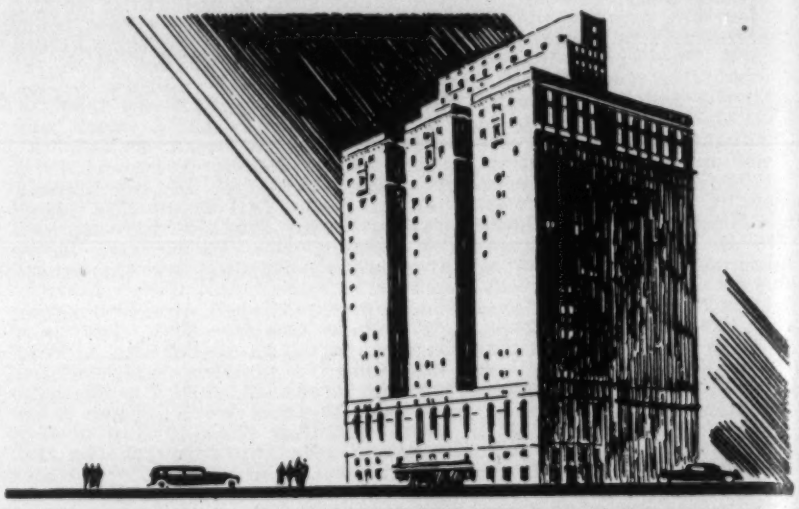
See *Metals & Alloys,* Vol. 3, May 1932, page MA 150. Ha (29)

Nickel-Chromium Heat-Resisting Alloys. *Machinery,* Vol. 38, Nov. 1931, page 175.

Very brief discussion of the use of this material in furnaces, thermocouples, pyrometer protection tubes, hearth block and for containers employed in hardening small tools. RHP (29)

Heat Resisting Metals. *Metallurgist,* Oct. 1931, pages 149-151.

An extended abstract of a paper by J. C. Woodson. See "Engineering Requirements for Metals in the Ferrous Metal Industries," *Metals & Alloys,* Vol. 2, Sept. 1931, page 193. VVK (29)



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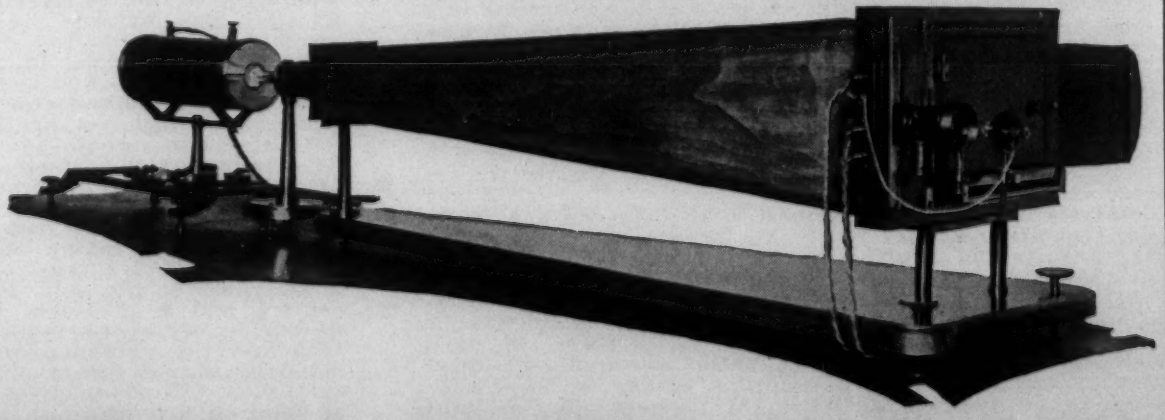

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LEACHING (30)

Recovery of Gold and Silver from Graphite and Non-Graphitic Waste. J. N. Plaksin & N. L. Zhurlov. *Tzvetnuie Metallui*, No. 9, Sept. 1931, pages 1156-1179.

Curves are plotted showing the effect of time and concentration of cyanide solutions on the recovery of Au and Ag from graphite wastes. The character of the curves depends on the NaCN content of the solution. The curves show rapid precipitation of Au from solution on account of the adsorption of the complex cyanide by graphite. Maximum extraction of Au is attained in less than 18 hrs.; after this the recovery decreases. The rate of deposition of Ag from the solution is considerably less. Recovery is the net result of the rate of solution of metals in the cyanide solution and the rate of adsorption by graphite, both depending on the concentration of the solution. As the most practical method of extraction of Au and Ag from graphitic waste the following are recommended: (1) Cyaniding in the presence of kerosene or pine tar to prevent adsorption. (A recovery of 99.03% Au and 94.93% Ag was obtained by this method.) (2) Cyaniding followed by treatment with Na_2S solution. (3) Igniting followed by amalgamation, or by amalgamation with Au amalgam in the presence of $CuSO_4$ or in Cl water. For lean non-graphitic waste 2 methods can be applied: (1) Amalgamation with simultaneous or subsequent cyaniding. (92.2% recovery Au and 83.82% Ag was obtained.) (2) Pyrometallurgical extraction from a concentrate obtained by preliminary table or flotation concentration. Table concentration gave higher recovery (80%) than flotation and should be preferred. Further treatment consists of Pb fusion and cupellation. BND (30)

The Recovery of Gold from the Ore of the Night Hawk Lake Mining Co., Ltd., Night Hawk Lake, Ontario. A. K. Anderson. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 130-135.

Cyanidation of a porphyry containing pyrite assaying Au 0.14-0.17 oz. and Ag 0.03-0.07 oz./ton gave highest recoveries (97%) with a cyanide consumption of 0.60 lb./ton of ore. Results by flotation and amalgamation alone and in combination are given. AHE (30)

The Recovery of Gold from the Ore of the Parkhill Gold Mines, Limited, Wawa, Ontario. A. K. Anderson. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 154-158.

A siliceous Au ore assaying 0.99 oz./ton gave recovery of 77.7% by amalgamation, 94.1% when followed by cyanidation. Flotation recovered 88%. Cyanidation of the ore ground to minus 200 mesh recovered 98% of the Au. AHE (30)

Experimental Tests on a Sample of Tailings from the Mill of the Argonaut Gold Mines, Limited, Larder Lake, Ontario. J. S. Godard. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 110-112.

A tailing assaying Au 0.115 oz./ton, Cu 0.19%, and Fe 9.93%, the remainder mainly SiO_2 gave a higher recovery by cyanidation (85%) than flotation. AHE (30)

Precipitation and Cyanide Recovery Process Developed by General Engineering Company. R. M. P. Hamilton. *Engineering & Mining Journal*, Vol. 133, Jan. 1932, pages 53-54.

An efficient, cheap method of recovering the cyanide and precious metals (if any) in barren solutions fouled by contact with cyanide-consuming ores is described. A flowsheet is shown for a precipitation and cyanide recovery plant and a table for precipitation equivalents. The process is cyclical, and requires simply the H_2SO_4 needed to regenerate the HCN from the Zn $(CN)_2$ precipitate, plus the little necessary for precipitation of Au and Ag with Zn, and the lime necessary to "fix" the regenerated HCN. Over 95% of the solutions going to the recovery plant may be re-used as fresh water in mill circuits. WHB (30)

Cyaniding Low-Grade Gold Ore. Chas. Volney Averill. *Chemical Engineering & Mining Review*, Vol. 24, Dec. 5, 1931, pages 87-91.

A description is given of the cyanide plant for the treatment of gossan at the Mountain Copper Co.'s works, Shasta Co., California. Gossan ore, hitherto not considered amenable to cyaniding, is successfully treated in a plant handling 550 tons per day at a cost for mining and milling of $.85/ton. The standard Merrill-Crowe vacuum process of precipitating Au from solution is employed. WHB (30)

Cyanidation: An Historical Note. B. K. Read. *Canadian Chemistry & Metallurgy*, Vol. 16, Jan. 1932, pages 30-31.

The failure of salt treatment is pointed out, the McArthur-Forrest process is outlined, and the rise in cyanide production noted. WHB (30)

Development of the Leaching Operations of the Union Miniere du Haut Katanga. Archer E. Wheeler & H. Y. Eagle. *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 459, Feb. 1932, 37 pages.

Developments at the Union Miniere since 1914 are reviewed, with special reference to the development of large scale leaching methods. The Cu can be dissolved readily by dilute H_2SO_4, but percolation through the crushed ore is slow. Therefore leaching by all agitation is desirable. Plants and flow sheets are described. Practically all of the ores, averaging 6.5 to 7.0% Cu, are oxidized. The ore is leached in Pachuca agitators, and the Cu extracted from the solution electrolytically. The cathode is refined at the smelter. 4 references. JLG (30)

Milling Practice of the Kirkland Lake Gold Mines (Ltd.), Kirkland Lake, Ontario. John Dixon. *United States Bureau of Mines Information Circular* No. 6508, Sept. 1931, 13 pages.

During 1930, heads to the mill assayed $11.38 of Au/ton of ore, of which $10.16 was recovered by cyanidation at a cost of $1.389/ton of ore. Details of costs and analyses of solutions, tailings, etc. are given. AHE (30)

Amalgamating and Cyaniding on Siscoe Island, Quebec. C. O. Steel. *Engineering & Mining Journal*, Vol. 133, June 1932, pages 319-322.

A simple arrangement at the discharge end of the ball mills, followed by amalgamation, recovers 78.5% of the Au in the ore. Blankets in the circuit recover an additional 7.0%. Cyanidation recovers 13.0%. Results of tests are tabulated and a flowsheet of the mill of the Siscoe Gold Mines is shown. WHB (30)

REDUCTION METALLURGY (31)

Overblowing in Blast Furnace Practice. W. McConnachie. *Iron & Steel Industry & British Foundryman*, Vol. 5, Mar. 1932, pages 233-234.

Overblowing destroys more than the usual quantity of cyanides and therefore affects the fuel economy in a blast furnace. CHL (31)

The Thermal Action of Sulphates in the Superroasting of Zinc Blendes. (Sur l'Action Thermique des Sulfates dans le Supergrillage des Blendes.) R. Palante. *Chimie et Industrie*, Special Number, Mar. 1931, pages 464-474.

A study is made of the relative effects of the various reactions in the roasting, and especially the super-roasting, of blendes, and of the exact thermal effect of the presence of $ZnSO_4$. Includes discussion. MAB (31)

Recent Improvements in the Greenawalt Sintering Apparatus. J. Tornblad. *Iron & Steel Institute, Advance Copy* No. 14, May 1932, 10 pages.

Improvements that have increased life of the apparatus and have enabled greater production are described. JLG (31)

The Reducibility of Crusted Coke and the Production of a Low-Carbon Forgeable Iron in the Cupola Furnace. (Ueber die Reduktionsfähigkeit von Ueberkrustetem Koks und die Herstellung eines Kohlenstoffarmen schmiedbaren Rinneneisens im Giessereischachtofen.) E. Piwowarsky. *Mitteilungen aus dem Giesserei Institut der Technischen Hochschule zu Aachen*, Vol. 2, Oct. 1931, 4 pages.

The reaction with CO_2 between 900° and 1100° C. of coke uncoated and of coke coated or impregnated with lime paste or milk of lime was studied. A larger amount of CO was produced from coke treated with lime than from the untreated coke. These results are greatly dependent on the air conditions in the cupola furnace, temperature and time of contact between Fe and coke charge. The production of a low-C Fe in the cupola requires a large amount of air, the blast tuyeres should be numerous and must distribute the air uniformly; eventually 2 rows of tuyeres should be arranged. The air preferably is preheated or even enriched by O, and the melt should be made in properly determined height of the coke charge. Further, high temperatures should be employed in order to accelerate the burning of the coke at a minimum of coke charge and with no less than 160 $m.^3$ air/min./$m.^2$. Fe with 1.6 to 1.8 C has been obtained in this manner. Ha (31)

The Semi-direct Production of Nickel Steel from Sudbury Ore. T. W. Hardy & H. H. Bleakney. *Canada Department of Mines, Mines Branch, Memorandum Series* No. 54, Mar. 1932, 16 pages; *Metal Progress*, Vol. 21, May 1932, pages 69-70.

Cu was removed from a disseminated Cu-Ni-Fe ore from the Falconbridge mine by flotation to give a concentrate analyzing Fe 48.02, Ni 3.52, Cu 0.50, S 31.75 and insoluble 9.20%. This concentrate was roasted to give a calcine analyzing Fe 54.96, Ni 4.07, Cu 0.49, S 0.21 and insoluble 10.18%. A reducing roast (city gas over calcine at 1100° F. in a rotary retort for 2 hrs.) followed by wet magnetic concentration (Grondal) gave a concentrate analyzing Fe 61.70, Ni 4.45, Cu 0.42, S 0.16 and insoluble 5.99%. After sintering, the material is metallized by any of the sponge-Fe processes. Using the product of the oxidizing roast, a mixture of 50 lbs. oxide, 18.25 lbs. bituminous coal and 12.0 lbs. lime was heated (electrically) in a rotary retort at 1750° F. for 3 hrs. to give a product analyzing Fe 46.60, Ni 3.65, Cu 0.36, and S 0.66%. 10 passes over a Stearns drum-type magnetic separator gave a concentrate analyzing Fe 72.80, Ni 6.00, Cu 0.58, and S 0.08% and tailing (40.30%) containing Fe 7.80, Ni 0.17, Cu 0.03 and S 1.53% for recoveries of 93.48% of the Fe, 98.08% of the Ni and 96.11% of the Cu with rejection of 92.79% of the S. Smaller-scale tests on the magnetic concentrate of the ore gave a sponge containing 89.67% metals. Briquetted sponge was used in making 5 different Ni steels; details of the charges and analyses of ingots are given. Recoveries of Ni and Cu are almost perfect; Fe recovery is more than 90%. All ingots rolled well without evidence of red shortness. Mechanical properties are given tabularly in comparison with steels of similar composition made with metallic Ni and show that the 2 are comparable. AHE+WLC (31)

Nickel-Copper Smelter at Falconbridge. *Canadian Institute of Mining and Metallurgy, Transactions* (in Bulletin 243), 1932, pages 315-322.

The Falconbridge plant is described. The coarse ore is smelted without roasting in a blast furnace. The necessary basic flux is furnished by converter slag plus enough limestone to give 5-6% CaO in the furnace slag. The low-grade matte produced (9.5-11% Ni and Cu) is blown-up in the converter to almost complete removal of Fe (less than 0.2%), using fine ore to provide necessary SiO_2 for fluxing. AHE (31)

Smelting at Rounskar, Sweden. A. G. Paul Palen. *Engineering & Mining Journal*, Vol. 133, June 1932, pages 339-342.

An outline is given of smelting operations at this plant, completed in 1930. The ore is a mixture of arsenopyrite, calcopyrite, and pyrite with admixtures of small amounts of other minerals bearing Au, Ag, Pb, Zn, and Sb. WHB (31)

The Metallurgy of Zinc. Samuel Field. *Metal Industry*, London, Vol. 40, Jan. 15, 1932, pages 78-80.

Processes of extraction of Zn are described. From low grade ores, Zn is recovered as ZnO in the comparatively new Waelz process. PRK (31)

Electrothermic Zinc. A. Walter. *Transactions Electrochemical Society*, Vol. 59, 1931, pages 87-94.

Includes discussion. See *Metals & Alloys*, Vol. 2, June 1931, page 123. (31)

The Blast Furnace Turbo Blowers of the Russian Steel Plants Magnitogorsk and Kusnezk. (Die Hochofenturbogebläse für die russischen Eisen- und Stahlwerke Magnitigorsk und Kusnezk.) M. Schattschneider. *B B C Nachrichten*, Vol. 19, May/June 1932, pages 41-48.

After briefly discussing the production capacities of the 2 new Russian steel plants, the turboblowers for the blast furnaces are described in detail and illustrated. GN (31)

NON-METALLIC COATINGS FOR METALS & ALLOYS (32)

Pipe Line Protection. F. A. Hough. *American Gas Journal.* Vol. 137, Aug. 1932, pages 11-13.

Soil survey made with Shephard Earth Resistivity Meters (soil rods) indicate areas where pipe protection is needed and extent of protection necessary. Details of this method are described in *American Gas Journal,* Apr. 1931, page 34. Protective coatings will be either: (1) double coal tar coatings with an asbestos felt wrapper; or (2), asphalt primer, hot coat of blended asphalt, rag felt wrapper, hot coat of blended asphalt, rag felt wrapper and Kraft paper. Protective coatings will be supplemented by electrical drainage or cathode protection whereby current will be drained from the pipe to the soil by an especially designed electrode so that the potential of the protected portions will be below that of the soil and corrosion at pin holes or bruised spots of the coating will be prevented. CBJ (32)

Enameling with Spray Guns. (Auftragen mittels Spritzapparaten.) M. Becker. *Emailletechnische Monatsblätter,* Vol. 8, June 1932, pages 43-44.

Discussion of the advantages of spray guns for enameling. GN (32)

Experiences with Bituminous Coatings for Rust Protection. (Erfahrungen mit Bitumenanstrichen als Rostschutz.) Nils Buer. *Bautechnik,* Vol. 10, July 29, 1932, page 430.

Abstract of a paper by J. Gram in *Meddeleser fra Norges Statsbaner,* Oslo, Feb. 1, 1932, in which the experiences of the Norwegian railways with bituminous coatings are reported. GN (32)

The Determination of the Cracking Strength of Enamels on Iron Articles. (Die Ermittlung der Abspringfestigkeit von Emailüberzügen auf eisernen Gegenständen.) E. Franke. *Sprechsaal für Keramik, Glas, Email,* Vol. 65, May 5, 1932, pages 328-329.

The various failures of enameled iron articles are first discussed, the possibilities of mechanically testing enamels are then described. The Herbert cloudburst test is found to be most adaptable. The uniformity of the testing conditions is emphasized for obtaining comparable results. GN (32)

The Effectiveness of Rust Prevention Paints. (Zum Wirkungsgrad von Rostschutzfarben.) A. Foulon. *Farbe und Lack,* Mar. 18, 1931, page 142.

Among the various rust protection paints only those metal oxides and metal salt additions serve their purpose which are electro-positive to Fe. The ground pigment most suitable for the passification of Fe, is red lead. For outer surface coatings, lead white and zinc oxide are employed. Special light protection is secured by red Fe-oxide and iron mica paints. EF (32)

Effect of Lead-Joint Heat on Bituminous Pipe Lining. Elson T. Killam. *Engineering News-Record,* Vol. 109, Aug. 18, 1932, pages 199-200.

Tests show that bituminous enamel linings in cast Fe pipes are not damaged seriously by the heat of the Pb used as joining material if the temperature of the Pb is not materially above its melting point. Other factors having influence are: atmospheric conditions and air temperature, grade of enamel, size of pipe, depth of Pb joint, class or thickness of pipe and the distance from melting pot to the joint. CBJ (32)

Steel Tubes with Centrifugally Cast Concrete Linings in the Pipe Line System of the City of Dresden. (Stahlrohre mit eingeschleuderter Betonschicht im Dresdner Wasserrohrnetz.) Schemel. *Die Röhrenindustrie,* Vol. 24, Mar. 26, 1931, pages 77-78; Apr. 9, 1931, page 89.

Experiences gained on previously used cast Fe and centrifugally cast pipes are reviewed and economical and technical viewpoints, when largely extending the municipal pipe line system are considered at length. The critical discussion on 6 different materials proposed is made. The final choice were wrought Fe pipes with a centrifugally cast concrete lining. Problems referring to the smoothness of the linings, joining of the pipes and the drilling of holes into it did not offer unsurmountable difficulties. The maximum length of the tubes was 14 meters and the maximum inside diameter was 1.50 meters. In case of the maximum diameter a concrete shell was employed, the over-all wall thickness amounting then to 10 cm. Asbestos cement was employed for joining the outside concrete shell. A testing tube was started in 1926 and after 3 year's operation, it was found to be in a perfect state. Only a thin chalk layer had been formed at the inside. Tests in the Technische Hochschule Dresden disclosed that the loss in pressure is 12% lower than in cast Fe pipes. This value certainly improves to 13-20% after being some time in service. Due to incrustations, pressure losses of 100% are encountered in cast Fe pipes. The paper was presented at the 77th General Meeting of the Gas und Wasserfachmänner, 1931. EF (32)

Heat Resisting Paint and Rust Preventative. *Iron & Coal Trades Review,* Vol. 124, Apr. 8, 1932, page 601.

"Kemick" is a paint with a liquid and volatile content which spreads it evenly on the surface and holds the pigment in place before heating. Under heat, the paint decomposes, the volatile matter evaporates and chemicals are liberated which react on the surface and become part of it and neutralize rust producing agents. Ha (32)

Loss of Heat in Pipe Lines Laid in the Soil. (Der Wärmeverlust von Rohrleitungen im Erdreich.) I. S. Cammerer. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Feb. 1932, pages 29-34.

Investigations were made on 2 pieces of pipe laid in the soil. The humidity of the soil, the range in temperature, and the extent of soil affected were taken into consideration. Insulation on the pipes was of uniform thickness. The loss of heat in non-insulated pipes was also determined, as well as the heat coefficient of the soil. The loss of heat in the pipes was calculated by means of the original equations for a heat current passing through cylindrical surfaces, with the zone affected taken as 3 m. In sandy soil the coefficient of heat conduction was found to be 1.0. MAB (32)

Non-tarnishing Silver. (Anlaufbeständiges Silber.) E. Raub. *Die Umschau,* Vol. 36, Jan. 3, 1932, pages 84-85.

Article discusses measures for preventing the tarnishing of Ag. The effect of alloying metals was not entirely satisfactory. Electroplating with Cr and metals of the Pt-group is effective. However color and metallic luster differ from pure Ag. The disadvantages inherent to coatings of lacquer, celluloid, collodium, etc., are critically reviewed. Attention is called to a novel coating method developed in the Forschungsinstitut für Edelmetalle, Schwäbisch-Gmünd. The chemical composition of the coating is not stated. EF (32)

Protection of Iron Against Rust. (Wie schütze ich Eisen vor dem Rosten?) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 12, 1932, pages 239-241.

Detailed discussion of the procedure to be followed in the Atrament coating process recently developed by the German Dye Trust. (1) cleaning of the casting, (2) the atramenting process, (3) subsequent treatment. The composition of Atramentol is not given, but it is stated that the surface to be coated is covered with a layer of phosphate by chemical means at temperatures of 98° C. To further increase the corrosion resisting properties the parts are finally blackened with Atrament black (W, S or L). Mixture W is soluble in water, mixture S is soluble in alcohol, the concentrations of the solutions can be chosen according to purpose. Mixture L is delivered ready for use. Any paint or lacquer coating or enamel can be used on the Atrament coating. GN (32)

Evaluating Lacquer Finishes. J. A. Reinhardt & E. A. Woelfel. *Metal Industry,* N. Y., Vol. 30, May 1932, pages 192-194.

Taken from *Monthly Review of American Electroplaters' Society,* April 1932. Some practical tests are described in detail which can be carried out without special laboratory equipment. These tests include determinations of the following: film-building and hiding power, drying qualities, color and luster, manipulation, resistance to perspiration, flexibility, adhesion and aging, humidity cabinet, hardness and resistance to abrasion. PRK (32)

Determination of Water Permeability of Paint Coatings. (Nachweis der Wasserdurchlässigkeit von Anstrichen.) H. Wagner. *Korrosion und Metallschutz,* Vol. 8, Mar. 1932, pages 66-68.

The chemical (Jäger) and galvanic testing methods (Ragg, Hermann, Metzger) for water permeability of paint coatings are critically discussed in the introduction. The author's method is based on the electromotive series used for detecting permeable spots in paint coatings. A $CuSO_4$ solution is applied for sheet Fe and $CdSO_4$ for galvanized Fe. Around the pores metallic Cu and Cd respectively are precipitated. The effect is very distinct and a microscope can be dispensed with in most cases. The reaction discussed can be applied for (A) testing the permeability of coatings on a metal carrier and (B) in laboratory tests on water permeability with respect to binding agents and paint coatings before being used. EF (32)

Paints for Ships. Henry Williams. *Industrial & Engineering Chemistry,* Vol. 23, Dec. 1931, pages 1340-1343.

The general question of painting ships, the need for doing so, and the various causes that lead to deterioration of ships' structure are discussed, as well as several classes of paints that present the most difficulties, and present problems to be solved by the paint technicians. MEH (32)

Suggestions for the Use of Lacquer Capable of Standing Punching in the Metal Industry. (Hinweise für die Verwendung stanzfähiger Lacke in der Metallindustrie.) Freitag. *Oberflächentechnik,* Vol. 9, June 7, 1932, page 113.

Nitro lacquers are mostly used for punched articles; they should adhere tightly to the metal and be sufficiently elastic. Points to be observed in the composition of the lacquer and treatment of the sheets are briefly pointed out. Ha (32)

Increasing Opacity in Cryolite Enamels. (Verstärkung der Weisstrübung in Kryolithglasuren.) *Emailletechnische Monatsblätter,* Vol. 8, July 1932, page 53.

It is advantageous to use besides cryolite other cheap darkening compounds such as alumina, phosphate, metal oxides, etc. It must be borne in mind, however, that white enamels supersaturated with such compounds do not have luster. A new compound is the "Deckborolith" which is melted together in white enamels and which increases the opacity without affecting the luster. GN (32)

Cast Iron Pipe Linings Prove Value. *Water Works & Sewerage,* Vol. 79, June 1932, pages 204-205.

In a discussion on protective linings on sewerage pipes now in use to prevent tuberculation and corrosion with its consequent friction loss it was brought out that bituminous linings have proved the best. Cement linings had given trouble due to becoming loose. The bituminous lining is centrifugally applied at 420° F. Ha (32)

The Principal Operations and Equipment in Enameling. (Die hauptsächlichsten Arbeitsgänge und Einrichtungen beim Emaillieren.) *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Aug. 4, 1932, pages 575-577.

The first of a series of articles on enameling. Discusses the pickling of raw ware to be enameled. GN (32)

The M B V-Method. (Das M B V-Verfahren.) *Apparatebau,* Vol. 44, July 22, 1932, pages 102-103.

The M B V (Modified Bauer-Vogel) method which was developed in 1931 by the Erftwerk, Grevenbroich, Germany is a coating method for protecting Al and Cu- rich Al alloys against the chemical attack of a large number of substances. The parts to be coated are dipped into an aqueous solution of calcinated $Na_2CO_3 + Na_2CrO_4$ at 90°-100° C. After 5- 10 minutes the parts are covered with a light to dark gray coating which resists hot and cold water, alcohol, diluted and concentrated solutions of NaCl but not acids and alkalies. Procedure, costs, properties and use of the new coating method are discussed. There was also developed a special method to be used at lower temperatures, by adding to the above M B V salt 150-160 g. of caustic potash/kg. of the salt. GN (32)

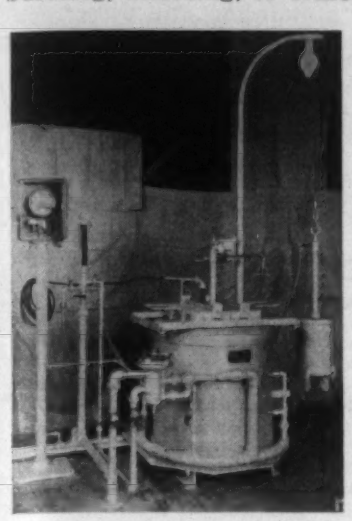
The Technique of Enameling. (Das Emaillierertechnik.) *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Mar. 31, 1932, pages 241-242; June 2, 1932, pages 407-408.

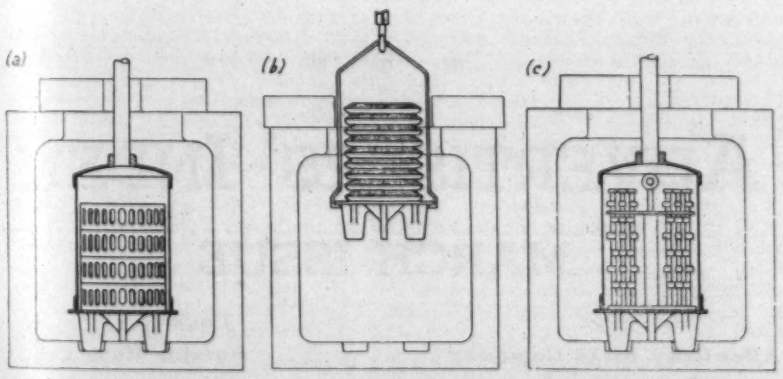
Abstract of J. E. Hansen papers in *Sheet Metal Industries.* See *Metals & Alloys,* Vol. 3, June 1932, page MA 191. GN (32)

NEW EQUIPMENT AND MATERIALS

Bell Type Retort Furnace

The New Universal Heat Treating Tool, as this bell type retort furnace is termed by its manufacturers, the American Gas Furnace Company, Elizabeth, N. J., is adapted for carburizing, nitriding, or either a carburizing hydrocarbon gas, ammonia for nitriding, or a neutral or inert gas for bright annealing, etc. According to the manufacturer, it can also be used for hardening, normalizing, annealing and tempering, and is "ideal for the jobbing shop where a great variety of work is handled from day to day." For the larger shop it is equally desirable because a battery may be installed and carburizing and other heat treating operations may be carried on simultaneously. Carburizing may be carried to a depth of 1/16" in one furnace and 1/64" only in the adjacent furnace. Other heat treating operations may be performed in still other furnaces. Small sizes are available which may be quickly heated to temperature and various heat treatments may then be performed successively with minimum delay. It is necessary only to have 2 or 3 spare bells with bases available to permit carburizing, then hardening followed by tempering. In annealing, to obtain a full anneal, work may be allowed to remain over night in the furnace after it has been shut down. This also applies to carburizing, should it be desired to obtain maximum diffusion and gradation of case to core. In this case the carburizing gas should be allowed to continue to pass through the retort during the slow cooling period, burning in the furnace and thus retarding the rate of cooling. Where comparatively slow cooling is satisfactory, the bell with its base and work may be removed from the furnace and air cooled or placed in a pit. Quenching direct from furnace temperature can be accomplished either by removing the bell, allowing the work on the base to remain in the furnace for removal of the individual pieces and quenching, or, as for example in the case of ring gears or other comparatively large gears, a special yoke may be used to elevate the base and work slowly so that the individual gears may be withdrawn and quenched in a jig, fixture, or quenching machine, as desired. (See Fig. b.)





The bells are not necessarily cylindrical as in Figs. a and c but may be rectangular or of some other shape better adapted to the particular work. Uniform results are said to be obtained because the retort is entirely enclosed in the furnace. In the case of carburizing, the spent carburizing gears escape from the bottom of the bell and are consumed in the furnace, thus increasing efficiency. Radiation losses are low and fuel economy said to be high. Extra bells are supplied according to the nature of the requirement so that the furnace can be maintained in production all the time. Furnace is provided with automatic temperature control, and with a flow meter for checking the flow of gas through the retort at all times. Two or more flow meters can be supplied where 2 or more gases are to be mixed for passing through the retort as, for example, in applying the Machlet Ni-Carb-Case.

Metals & Alloys, March 1933.

Metal Polish in Powder Form

Products heretofore on the market give unstable suspensions in naphtha or gasoline and are unsuitable for use in making water base polishes, according to the Hull Co., Brooklyn, N. Y., which has brought out a new one consisting of silica and suitable emulsifying and stabilizing agents, and manufactured and sold in dry form. The consumer mixes the powder with water in the proper proportion to give a stable water base metal polish for use. Supply houses buy in bulk, mix with water, put in cans under their own label and sell to consumer trade as liquid metal polish. The product was recently used, in liquid form, in filling a government bid.

Metals & Alloys, March 1933.

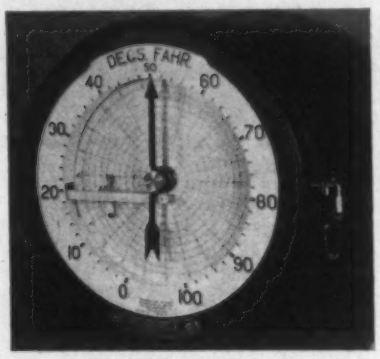
Beryllium Copper Alloys

The Riverside Metal Co., Riverside, N. J., has begun the manufacture of beryllium copper alloys. The company is producing beryllium copper in the form of rods, sheets, wire and strip.

Metals & Alloys, March 1933.

Indicating-recording Potentiometer

A new round-chart Micromax Indicating Recorder, announced by Leeds & Northrup Co., Philadelphia, is said to be a "junior instrument, not capable of all that the strip-chart Micromax can do, but it brings the reliability and low-cost maintenance of the motor-driven null recorder to a price class that has never enjoyed these advantages before." These characteristics are said to be especially valuable in pyrometers of about 400 to 900 or 1000°F. range. The new instrument has a boldly-lettered circular scale, and uses a 24-hour 10" circular chart which has straight-line time coördinates, instead of curved ones, on a calibrated portion 3½" wide. The recorder is made as a single-point instrument only, and can be equipped with 2 signal or control contacts. Potentiometers are manually standardized. The mechanism, mounted on a frame hinged to the case, may be swung out if desired. The case is 16½" diameter, and may be mounted either flush or hanging on the face of a wall or panel.



Metals & Alloys, March 1933.

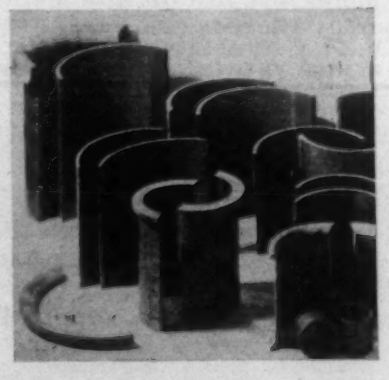
Photographic Plate

Designed especially for photomicrography of metal specimens, a new photographic plate, announced by the Eastman Kodak Co., Rochester, N. Y., is not only particularly suitable for metallography but should appeal, it is said, to photomicrographers who prefer not to use panchromatic plates, such as the Wratten "M" plate, which require handling in the dark. The characteristics of Wratten Metallographic Plates which render them specially useful for metallography are high resolving power; availability of a very high photographic contrast, for such subjects as steels at high magnification; availability of lower contrasts, yielding good negatives where there is high contrast in the image, as with steels at low magnifications, cast irons, etc.; high green sensitivity as well as high sensitivity to blue light, when used either with achromatic objectives and green filters or with apochromats (the speed under green light is unusually high in view of the high contrasts obtainable, the speed under blue light has been achieved without sacrifice of the emulsion's resolving power); absence of sensitivity to red light: the plates can be handled in the normal red light of a Wratten Series 2 Safelight.

Metals & Alloys, March 1933.

New Bearing

Made in sizes up to 32" O.D. from synthetic resin similar to Bakelite and with textile material as the base, a new bearing brought out by Joseph T. Ryerson & Son., Inc., Chicago, is neither fusible nor soluble after treatment: the composition cannot be re-softened by heat, will not absorb water or oil and is resistant to most acids. It is, however, attacked by hot caustic alkalies. "Ryertex," as this new product is called, shows a Brinell reading of about 30-40 and a Scleroscope reading of 70-80, and will outlast babbitt and bronze applications from 4 to 10 times, it is said. The bearings are particularly satisfactory where water is applied as a lubricant. For rolling mills and other special applications, it is said that the greater hardness of the bearing permits the roller to hold his section better as the wear is much slower. In the major steel mills, roll neck and roll table bearings in rod, strip, bar, structural, plate and blooming mills, etc., have successfully passed tests. The difficulty and expense of keeping mill bearings oiled, and the fact that there is plenty of water already available, make this type of bearing suitable for these applications.



Metals & Alloys, March 1933.

MANUFACTURERS' LITERATURE REVIEWS

47 **Phosphor Bronze**—Booklet B-15 of the American Brass Company, Waterbury, Conn., discusses the physical properties and applications of their phosphor bronze. This is furnished in several grades, depending on the use to which it is to be put.

48 **The Alloy Pot**—Vol. 1, No. 1, of this series of folders issued by the New Jersey Zinc Co., New York, N. Y., features a table showing the physical properties of the Zamak alloys. The company plans to discuss new and interesting zinc die castings in each number.

49 **Croda Fluid**—A leaflet describing the three grades of this rust preventive is being distributed by Cox, Aspden & Fletcher, 26 Courtlandt St., New York, N. Y. It is useful for the protection of steel goods or parts in transit and for the preservation of equipment which is temporarily out of service. It is supplied in red or blue color, as well as its natural light brown.

50 **Nitralloy**—The three groups of Nitralloy are described in a leaflet recently issued by The Nitralloy Corporation, 230 Park Ave., New York, N. Y. It also discusses the special alloy steels classified as "Nitrard" which give a core hardness of 500-650 Brinell, and "Nitricastiron," their nitrided cast iron. Lists of applications for the alloys are given.

51 **Gas Burning Equipment**—The North American Manufacturing Co., 2910 East 75th St., Cleveland, Ohio, has prepared a leaflet devoted to their blast burners, butterfly air valves, nozzles, burner tips, etc. Illustrations and prices are shown. Other leaflets by the same company describe their "Duplex" Shut-off Valves, High Pressure Gas Burners, Oil Burning Equipment and Turbo Blowers.

52 **Enduro Stainless Steel**—A most attractive bulletin sent out by the Republic Steel Corp., Massillon, Ohio, discusses their Enduro stainless alloys, giving their analyses, physical properties and data on their proper fabrication. Numerous illustrations show typical methods of installing these alloys.

53 **Herculoy**—A recent bulletin of the Revere Copper & Brass, Inc., New York, N. Y., describes their "Herculoy," a silicon bronze which combines high strength with a high resistance to corrosion. The dimensions, gages and prices of Herculoy in various shapes are given.

54 **Wrought Iron Billets**—The A. M. Byers Co., Pittsburgh, Pa., has prepared a leaflet on their wrought iron billets. These billets are furnished in all desired sizes and a price list for various specifications is included in the bulletin.

55 **Electric Heating Units**—Bulletin GEA-1520A of the General Electric Co., Schenectady, N. Y., describes their line of small heating units and devices such as immersion heaters, strip heaters, metal-melting pots, glue pots, soldering irons, control equipment, etc. Bulletin GEA-1145B discusses their steam turbines for the mechanical drive of pumps, fans, compressors, pulverizers, etc.

56 **Instruments for Spectrographic Analysis**—A 48-page booklet issued by the Bausch & Lomb Optical Co., Rochester, N. Y., is designed for two classes of workers. The first group includes experienced research workers who need only detailed descriptions of the instruments to guide them, and the second includes workers in analysis and research who have little or no detailed knowledge of spectrographic methods. The chapter "Spectrography in the Analytical Laboratory" will be of especial interest and assistance to this latter class.

57 **Q-Seal**—The Quigley Company, Inc., New York, N. Y., has issued their Bulletin No. 207 describing their "Q-Seal," a plastic, expansive joint sealing compound for industrial use. It is said to be high pressure steam-, oil-, acid- and chemical-proof. Their Bulletin No. 305 is devoted to "Mono-Line," a highly stable plastic refractory for monolithic, air- and gas-tight furnace linings, and for quick and durable furnace repairs.

58 **Pyro Radiation Tubes**—Bulletin No. 40 of the Pyrometer Instrument Co., New York, N. Y., gives the specifications for their standard types of radiation tubes, showing two suggested installation methods.

59 **Electric Furnaces**—The Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa., is distributing reprints of an article entitled "Essex Slashes Camshaft Costs with Electric Furnace Alloy."

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60 **Flexarc Welders**—Two leaflets describing the new 300 and 400 amp. gasoline engine driven Flexarc Welders have recently been announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Both welders may be used with bare or coated electrodes.

61 **High Chromium Cast Iron**—A leaflet sent out by the Electro Metallurgical Co., New York, N. Y., refers to their high chromium cast irons (Cr = 15-30%). These irons are practically free from growth at high temperatures, show little scaling and are resistant to many forms of corrosion.

62 **Metal Melting Furnaces**—The Monarch Engineering & Mfg. Co., 1206 American Bldg., Baltimore, Md., has prepared a leaflet describing and illustrating their furnaces for the melting of brass, bronze, copper, aluminum, etc. They may be either oil or gas fired.

63 **Progress in Oxy-Acetylene Welding**—The feature article in the January issue of Oxy-Acetylene Tips, published by the Linde Air Products Co., New York, N. Y., is a brief but interesting review of oxy-acetylene developments during 1932. Other articles in the same issue are "Welding High Manganese Steel" and "The Foundry Economizes."

64 **Heat Treating Furnaces**—A bulletin recently issued by the Surface Combustion Corporation, Toledo, Ohio, describes and illustrates several of their heat treating furnaces, giving operating data for various types.

65 **Seamless Pipes and Tubes**—Bulletin No. 20 of the National Tube Co., Pittsburgh, Pa., is devoted to their 4-6% chromium seamless pipes and tubes. Tables showing the physical properties of these tubes are included as well as charts which illustrate their high temperature properties.

66 **Pipe for Water Wells**—A folder which has just been published by the Republic Steel Corp., Youngstown, Ohio, explains the numerous advantages of their electric weld pipe which make it useful for well drilling.

67 **Luxit**—A recent folder of the Alpha-Lux Co., New York, N. Y., describes the process to be used in patching furnace linings and for lining gas or oil fired crucible furnaces and ladles.

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PROPERTIES OF METALS (1)

The Electrode Potential of Iron. Part I. Measurements in an Atmosphere of Hydrogen. KWANJI MURATA. *Journal Society of Chemical Industry, Japan,* Vol. 35, May, 1932, pages 209B-214B.

Experiments were performed to determine the reversible electrode potential of active Fe in nearly the same way as in the case of nickel (K. Murata, *Bulletin Chemical Society,* Japan, Vol. 3, 1932, pages 57, 253, and 267), but with more precautions. After carrying out a large number of preliminary experiments, it was found that a sintered mass of Fe powder was the best in its reproducibility and that the absolute exclusion of O from the electrode and the electrolyte and also of free acid from the latter are the essential requirements for the reversibility of the potential. The procedure and apparatus are described. The results are given in tables and graphs. As the true standard electrode potential of Fe at 25° C., the value –0.4265 volt is accepted by the reason stated in the experimental part and the free energy of formation of ferrous ion at 25° C. is calculated to be –19,670 calories. MAB (1)

Magnesium. Melting, Pouring, Casting, Utilization. (Le magnesium. Fusion-coulee-fonderie-utilisation.) R. DE FLEURY. *Revue de Metallurgie,* Vol. 29, July, 1932, pages 341-346.

Mg must be protected with a layer of flux in melting. Excess chloride flux contaminates the metal with entrapped salts, thus affecting its corrosion resistance. 2 fluxes are recommended. The metal is melted with the first flux (60 $MgCl_2$, 40 NaCl or KCl). At about 730° C. the flux rises to the top. This temperature is maintained for about 10 min. The second flux, composed of fluorides, is then added in an amount equal to 20-30% of the first flux. A solid crust on the surface gives better protection. This is obtained by changing the composition of the fluoride flux. 2 formulas are recommended: 85 MgF_2, 5 NH_4HF_2, 3 NH_4Cl, 7 BO_3 (fused), 15 BaF_2 and 5 NH_4HF_2, 7 BO_3 (fused), 3 NH_4Cl, 70 MgF_2. Violent reaction with the moisture of the molds is prevented in casting Mg by adding to the sand substances volatilizing at the casting temperature among which are: tars, naphthalene, sulphur, volatile organic salts, etc. These form a species of neutral layer around the metal. Boric anhydride and ammonium borate stand between these 2 classes. As the remelting lowers the qualities of Mg a formula is proposed for estimation of these qualities in terms of the number of the remelts. Mg flowing past the mold wall overheats it and destroys the protective action of additions. The amount of local overheating must be reduced by increasing the number and reducing the size of the gates. JDG (1)

First Report of the Committee on Atomic Weights of the International Union of Chemistry. G. P. BAXTER, Chairman. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1627-1639.

The report includes the metals Ca, V, Cr, As, Ta, Re, Tl and Pb (RaG). A summary of the work of Aston (mass spectrograph) on the metals Cr, Zn, Mo, Sn and Hg with the isotopic weights and percentages, the packing fractions and the atomic weights are given. MEH (1)

The Preparation of Pure Cerium. (Preparation de Cerium Pur.) MAURICE BILLY & FELIX TROMBE. *L'Industrie Electrique,* Vol. 41, Feb. 25, 1932, pages 89-90.

Reviews the methods of preparing Ce by electrolysis. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 297. Ha (1)

The Suitability of Tantalum as a Material for Laboratory Apparatus. (Ueber die Eignung von Tantalmetall als Werkstoff für Laboratoriumsgeräte.) B. FETKENHEUER & E. CREMER. *Siemens-Zeitschrift,* Vol. 12, May 1932, pages 168-171.

Very comprehensive tests were made with pure, gas-free Ta with respect to resistance to chemicals. Ta melts at 3027° C. and is, in the pure state, very ductile and can be rolled to sheets of 0.05 mm. It absorbs gases readily when it is red or white hot; at 600° C. it can absorb up to 740 times its own volume. On account of its resistance to acids it can often replace Pt and is sometimes even superior to it. It was further determined under which conditions Ta can be used instead of Pt as cathode material for electrolysis in the deposition of Cu, Zn, Ni, Co, Ag, Au, and Cd. It cannot be used for the deposition of Sn. The results of 36 tests with chemicals are tabulated. Ha (1)

Magnesium—Industry's Lightest Structural Metal. JOHN A. GANN. *S. A. E. Transactions,* Vol. 26, 1931, pages 620-634, 641.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 241. (1)

The Rare Metal Hafnium. (Das seltene Metall Hafnium.) FREISER. *Die Umschau,* Vol. 36, May 14, 1932, page 396.

Note on element 72, discovered in 1923 by X-ray spectra, closely related to Zr, and often naturally occurring with Th and U. The separation from Zr is very difficult. Price of HfO_2 is 25 RM per gram. Its melting point of 2230° C. and its considerable emission ability attracts the radio industry. EF (1)

The Electrical Conductivity of Copper. G. ELSNER & P. SIEBE. *Metallurgia,* Vol. 129, Aug. 1932, pages 129-132.

See *Metals & Alloys,* Vol. 2, May 1931, page 94. JLG (1)

Preparation of Pure Magnesium by Sublimation. J. HÉRENGUEL & G. CHAUDRON. *Genie Civil,* Vol. 99, Nov. 1931, pages 533-534.

See *Metals & Alloys,* Vol. 3, July 1932, page MA 195. (1)

The Diffusion Speed of Copper in Gold. (Die Diffusionsgeschwindigkeit von Kupfer in Gold.) W. JOST. *Zeitschrift für physikalische Chemie,* Abt. B, Vol. 16, Mar. 1932, pages 123-128.

Annealed Cu wires of 0.5 mm. diameter were electroplated with a Au-coating 4-12 x 10^{-4} cm. thick. Samples were exposed to temperatures between 300° and 616° C. for 10-2850 min. After being heat-treated the samples were investigated by X-rays and the diffusion constants were computed. The calculations are based on the changes of the space lattice constants. The data obtained which are presented graphically, are in fair agreement with the results of Eisenhut & Kaupp (*Zeitschrift für Elektrochemie,* Vol. 37, 1931, page 460) but are not in accordance with Tannaka & Matano (Mem. Coll. Sc. Kyoto Imp. Univ. Vol. 14, 1931, page 59) who determined the diffusion constants by conductivity measurements. EF (1)

Directional Properties in Cold-rolled and Annealed Copper. ARTHUR PHILLIPS & E. S. BUNN. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1933, pages 353-372.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 159. (1)

The Magnetic Properties of Iron and its most Important Alloys. (Die magnetischen Eigenschaften des Eisens und seiner wichtigsten Legierungen.) O. VON AUWERS. *Die Naturwissenschaften,* Vol. 20, Apr. 8, 1932, pages 257-264.

The maximum permeability of "Fe" has been increased 30 times during the last 30 years while the hysteresis loss is only 6% of the value established 40 years ago. The present trend is (A) a scientific one, based on Heusler's discovery of ferro-magnetism in alloys composed of non-magnetic elements and (B) a commercial one, going back to Warburg's interpretation of the hysteresis loop on one hand and to the discovery of the Si-bearing dynamo steel by Barret, Brown and Hadfield on the other hand. The magnetization curves of pure single crystals of Fe along different crystallographic axes is discussed, showing anisotropic behavior, absence of hysteresis losses and a high degree of permeability. Apart from the large desirable permeability, the constancy of permeability which is independent of the field density, is of commercial significance. The recent progress along these lines is traced and the results presented in diagrams. Further illustrations compile data from B-H, μ-H, μ_0-frequency measurements on Si-bearing dynamo steel, Permalloy A, B, C, electrolytic Fe, Hypernik, and Perminvar of various analyses. In this historical review, emphasis is placed on the contributions of Elmen, Masumoto and Kuehlewein. The writer derives that the latest technical alloys are leading back to the crystal-physics of scientific ferro-magnetism which is more or less a problem of internal stresses and crystal structure. EF (1)

Observations on the Pressure of Fluidity of Annealed Metals. HUGH O'NEILL & HUBERT GREENWOOD. *Journal Institute of Metals,* Vol. 48, 1932, pages 47-68.

Includes discussion. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 233. (1)

Diffraction of Low-Speed Electrons by Single Crystals of Copper and Silver. H. E. FARNSWORTH. *Physical Review,* Vol. 40, May 1932, pages 684-712.

Single crystals of Cu and Ag were prepared by the "solidification from the melt method." The methods used are described briefly. Previous results on diffraction beams for normal incidence on the (100) faces of Cu and Ag are checked and extended. Diffraction beams due to a surface lattice on the (110) faces of Cu and Ag formerly reported have since been found to decrease in intensity after prolonged heat treatment of the Cu crystal at temperatures near its melting point. Experimental methods of distinguishing between effects due to surface action and those due to a space lattice are discussed. WAT (1)

Observations on the Rare Earths. XXXVII. Electrolytic Preparation of Rare Earth Amalgams. 1. Preparation of Amalgams of Lanthanum and Neodymium. L. F. AUDRIETH, E. E. JUKKOLA & R. E. MEINTS, with B. S. HOPKINS. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1805-1809.

Presented before the Division of Physical and Inorganic Chemistry at the Indianapolis meeting of the American Chemical Society, Apr. 1931. Amalgams of neodymium and lanthanum may be prepared by electrolysis of aqueous and alcoholic solutions of various salts using a mercury cathode. These amalgams are extremely reactive and undergo ready decomposition. The free metals may be obtained from them by heating the amalgams in vacuo. MEH (1)

Thermal Expansion of Lead. PETER HIDNERT & W. T. SWEENEY. *Physical Review,* Vol. 35, Feb. 1930, page 296.

Data on the linear thermal expansion of a sample of cast Pb and various Pb-Sb alloys between 20° and 60° C. were published in 1924 by Vinal. Since then additional determinations were made on 3 samples of cast Pb over various temperature ranges between 20° and 300° C. The results show that the differences obtained in the coefficients of expansion were evidently due to variations in the methods of casting. WAT (1)

A New Commercial Metal—Indium. ELLIS K. BALDWIN. *Brass World,* Vol. 28, May 1932, pages 98-99.

Broad possibilities are predicted for indium in jewelry, dental work, the electric field, automobile hardware, radio, and television. WHB (1)

The Thermochemistry of Thallium. (Zur Thermochemie des Thalliums.) W. A. ROTH & A. MEICHSNER. *Zeitschrift für Elektrochemie,* Vol. 38, Feb. 1932, pages 87-93.

The heat changes associated with a series of reactions were measured calorimetrically. The e.m.f. and its temperature coefficient were determined for the cell: Zn | $ZnSO_4 \cdot 3200\ H_2O$ | $Tl_2SO_4 \cdot 3200\ H_2O$ | Tl. The solubility of TlCl in dilute aqueous HCl at 20° C. was determined. From these auxiliary data, the heats of the following reactions in kg.cal.$_{15}$ for 20° C. and constant pressure, weights not reduced to vacuum, were computed. Ha (1)

Experiments on the Polarization of Electrons. (Versuche zum Nachweis einer Polarisation der Elektronen.) E. RUPP. *Physikalische Zeitschrift,* Vol. 33, Feb. 15, 1932, pages 158-164.

Paper before the Deutsche Physikalische Gesellschaft, Bad Elster, Sept. 1931. Reports on experiments on the polarization of electrons (1) double reflection under a glancing angle of incidence and (2) under 90° scattering angle and subsequent passing of a thin foil. The first set of experiments yielded an unequal reflection of 6-8% on W, 7-11% on Au and 12-14% on Th in case of electrons of 80 kv. On Be, Al and Ni no polarization could be observed within the limit of error (3-5%). Hydrogen canal rays of 20 kv. discharge voltage do not exhibit a polarization. The data gained with the testing conditions mentioned under (2) are graphically presented and show the correlation of the polarization to the ray velocity and nature of the reflecting metal. By the agency of external magnetic fields, it is shown that the polarization effect is closely related to the magnetic moment of the electron. EF (1)

Properties of Copper Deoxidized with Calcium. LYALL ZICKRICK. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 11 pages.

Small melts of Cu were deoxidized with Ca, Si, CaB_6 or combinations of these materials. All but 0.002% O was removed by 0.0375% Ca. Small ingots cast from the deoxidized Cu had deep pipes characteristic of such material. Particles of what appeared to be a Ca-rich compound were observed in the microstructure of the deoxidized Cu. Wires were drawn and their properties determined in the cold-drawn condition and after annealing at various temperatures. Residual Ca and Si increased the softening temperature, and decreased electric resistance. The tensile strength and elongation were not greatly affected by deoxidation. 6 references. JLG (1)

Radiation Properties of Oxidized Palladium. (Strahlungseigenschaften von oxydiertem Palladium.) W. ZOBEL. *Annalen der Physik,* Series 5, Vol. 9, No. 5, 1931, pages 519-536.

In the range of 300° to 600° C. the temperature radiation of oxidized Pd was measured as a function of the surrounding pressure. At 0.01 mm.Hg a steep maximum was found, after which the radiation drops below the initial value. The pre-treatment of the metal has a considerable influence on the radiation. Ha (1)

Copper Embrittlement, II. L. L. WYMAN. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 11 pages.

Cu was deoxidized by 1 or more of the following substances: Ca, CaB_6 or Si. The samples were rolled into sheet and heated alternately in oxidizing and reducing atmospheres. Deterioration due to such treatment was detected by bend tests and microscopic examination. None of the Ca-deoxidized Cu was affected by the usual H embrittlement. The double deoxidized samples had the highest resistance to alternate heatings in oxidizing and reducing atmospheres. 4 references. JLG (1)

The Melting Point of Iridium. (Der Schmelzpunkt von Iridium.) H. VON WARTENBERG, H. WERTH & H. J. REUSCH. *Zeitschrift für Elektrochemie,* Vol. 28, Feb. 1932, page 50.

From 50 observations on specially prepared pure Ir, the melting point was found to be 2435 ± 15° C. (calculated with c_2 = 14,320). A few percent of Os or Ru increase the melting point several 100°. 5 references. Ha (1)

Ferromagnetism and Electric Properties. V. The Thermomagnetic Effect in the Longitudinal Magnetic Field as Observed on Nickel and Iron. (Ferromagnetismus und elektrische Eigenschaften. V. Der thermomagnetische Effekt im longitudinalen Magnetfeld beobachtet an Nickel und Eisen.) HEINZ BROILI. *Annalen der Physik,* Series 5, Vol. 14, Aug. 1932, pages 259-272.

If a temperature gradient exists from one end of a wire to the other and at the same time a longitudinal magnetic field is applied parallel to the temperature gradient, an e.m.f. exists at the ends of the wire; the polarity depends on the direction of the temperature gradient and is independent of the direction of the magnetic field. The relations between e.m.f. and magnetization and temperature were investigated and the tests are described. 11 references. Ha (1)

The Magnetization of Iron Immediately above the Curie Point. (L'Aimantation du Fer immediatement au dessus du Point de Curie.) L. NEEL. *Revue Generale de l'Electricite,* Vol. 31, May 21, 1931, pages 699-700.

The magnetic susceptibility of Fe changes very rapidly with the temperature within about 10° just above the Curie point; even for temperature differences of only 0.03° C. extremely large magnetic variations take place. See also *Metals & Alloys,* Vol. 3, June 1932, page MA 158. Ha (1)

Gmelins Handbook of Inorganic Chemistry. Iron. (Gmelins Handbuch der anorganischen Chemie, Eisen.) Part B, Section 5. Verlag Chemie, Berlin, 1932. Paper, 7 x 10 inches, 293 pages. Price 53.50 RM.

This is the fifth and last section of Part B of the volume on iron. The survey on iron compounds is completed in discussing the compounds of Fe with Li, Na, K, NH_3, Rb, Be, Mg, Ca, Sr, Ba, Zn, Cd, Hg, Al, Ga, In, Tl, rare earths, Zr, Th, Sn, Pb, V, Nb, Cr, Mo, W, U, Mn, Ni and Co. It does not discuss alloys. For reviews of earlier sections of this work see *Metals & Alloys,* Vol. 1, Dec. 1930, page 918; Vol. 2, Oct. 1931, page 207; Vol. 3, May 1932, page MA 116.
G. G. Neuendorff. (1)-B-

Technical Materials, Their Properties, Defects and Testing. (Die technischen Werkstoffe, Ihre Eigenschaften, Fehler und Prüfung.) OTTO SCHWARZ. Johann Ambrosius Barth Verlag, Leipzig, 1932. Paper, 6¾ x 9¾ inches, 222 pages. Price 24.50 RM.

In a clear and concise manner the author presents the properties of the important materials of construction. While too brief to do complete justice to the title, the space devoted to various subjects conforms well to their relative importance.

Mechanical properties are defined and described in a brief but adequate manner. Then, even more briefly the concepts of physical metallurgy are presented.

The body of the book deals systematically with the properties of specific materials. Non-metallic materials are briefly mentioned. The book closes with a description of machines and instruments for testing materials.

The treatment is quite up-to-date. Nothing of only historical interest is described. While some of the data are probably new the book contains little which has not been previously known. It should prove to be a good reference book. H. W. Russell (1)-B-

Metallurgical Properties of Metals and Their Effect upon Welding Operations. JOS. F. OSTERLE. *Welding Engineer,* Vol. 17, July 1932, pages 28-29, 39.

A general survey of the properties of metals as far as they are of importance to welding, their chemical affinities to form compounds and alloys, their structure, effects of heat and work on crystal size and the influence of impurities on welding characteristics. Ha (1)

Principal Factors in the Castability of Pure Metals. (Facteurs Principaux de la Coulabilité des Metaux Pures.) A. PORTEVIN & P. BASTIEN. *L'Usine,* Vol. 41, Mar. 18, 1932, page 29.
See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 261. Ha (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

The Thermal Conductivity of Some Non-Ferrous Alloys. D. HANSON & C. E. ROGERS. *Engineering,* Vol. 133, Mar. 18, 1932, pages 354-355.

Condensed from paper read before the Institute of Metals, March 9, 1932. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 289. LFM (2)

Preparation of a Special Brass. (Herstellung eines Sondermessings.) R. BERGER. *Zeitschrift für die gesamte Giessereipraxis, Das Metall,* Vol. 52, Aug. 30, 1931, pages 85-86.

The preparation of a corrosion resistant special brass of great hardness is fully described, the following data being included: Analysis = 58% Cu, 35% Zn, 2% Al, 2% Ni, 2% Mn, 1% Fe; tensile strength = 50-60 kg./mm.^{2}; elongation = 15-25%; Brinell hardness = 110-130. The utilization of highly pure metals is stressed in order to secure values given above. Cu of at least 99.6% and Zn of 99.9% are used as virgin metals, while Al is introduced as an 80/20 Cu-Al alloy. Fe, Mn and Ni are added as a Cu alloy of about 68% Cu. Al raises the yield point (1% = + 10 kg./mm.^{2} while elongation drops 8% per 1% Al). Fe induces a fine grain and slightly increases both elongation and tensile strength up to 1% Fe. Mn improves the corrosion resistance and otherwise acts the same way as Al and Fe. Ni exerts the same effect as Mn. The preparation of the primary alloys and the casting of the final alloy is fully outlined. The use of scrap and the most suitable form and material for the mold are discussed. EF (2)

The Thermal Conductivity of Some Non-Ferrous Alloys. D. HANSON. *Journal Institute of Metals,* Vol. 48, 1932, pages 37-45.

Includes discussion. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 289. (2)

Study of the Composition of a Roll Bearing. (Etude de la composition d'un coussinet de laminoir.) M. G. ANTOINE. *La Fonderie Belge,* Vol. 2, Feb. 1932, pages 31-34.

The original melt was of Cu-Sn alloy with Zn, Pb, Ni and P additions. The pouring temperatures were difficult to check due to the fumes and vapors which made the optical pyrometer useless. Factors studied are: (1) Length of life in service. (2) Wear. (3) Mechanical properties. Results are expressed in 4 diagrams and 2 tables. Structure is given in 4 micrographs. Summary of results: (1) P has a considerable effect upon the length of life which increases with the P content. (2) Increasing the Sn content to 12-13% is not advisable because brittleness is such that the bearing cannot resist the shocks of the roll. (3) A high Ni content increases hardness and causes rapid breakage. (However bearings with 3-4% Ni are used with coating of white metals. Ni is then useful for improving the crushing strength). (4) Pouring temperature has an effect upon the properties of the metal; a high pouring temperature would give better bearings. FR (2)

Ordinary and Special Bronzes: Zinc Bronzes. (Les Bronzes Ordinaires et les Bronzes Spéciaux: Les Bronzes au Zinc.) LEON GUILLET. *Cuivre et Laiton,* Vol. 5, July 15, 1932, pages 305-306.

The general properties, structure and compositions used for practical purposes are briefly discussed. Ha (2)

Effect of Crystal Size on Physical Properties of Tin-base Babbits. ERNEST B. DRAKE. *Metals & Alloys,* Vol. 3, Mar. 1932, pages 77-81.

The author presents the results of casting an 85% Sn, 7.5% Cu, 7.5% Sb babbitt metal from temperatures from 750° to 1000° F. with mold temperatures from room temperature to 450° F. The study consisted of macro and micro examination of the structure, hardness tests and compressive strength tests. The results show that the crystal size of cast babbitt may be controlled by means of casting and mold temperatures, that the hardness as measured is not related to crystal size and that the compressive strength decreases somewhat with increased crystal size. WLC (2)

New Antifriction Alloys with High Content of Copper and a Lead Base. (Nouveaux Alliages Antifrictions à haute Teneur en Cuivre et à Base de Plomb.) A. RICARD & H. ACKERMANN. *Cuivre et Laiton,* Vol. 5, July 15, 1932, pages 295-304.

The study of antifriction alloys has shown that they must possess a heterogeneous structure and a basis of solid solutions or eutectics or a mixture of the two, in which hard particles are embedded. This is necessary in order to permit the rubbing surface to follow the deformations of the rotating piece while the hard parts resist the friction and are worn by it. While formerly bearing metals had mostly a base of Sn, recently equal and even better antifriction metals have been made with a base of Pb and large additions of Cu. A list of the principal alloys in general use is given in the following table:

No.	Sn	Sb	Cu	Pb	Use
..	95.5	1.2	1.5	1.43	Aviation
..	93	3.5	3.5	...	
1	83	11	6	...	Charpy alloys
2	76.5	11	5	7.5	Machinery
3	71.1	9.5	4.35	14.52	Street Cars
4	60	13	5	22	Locomotives
5	50	14	5	31	Railroad Cars
6	40	15	5	41	High Speed Steam Engines
7	38	10	3	19	Freight Train Locomotives
8	16	16	3	65	Freight Train Locomotives
9	5.5	16.5	2	76	Freight Train Locomotives
10	0	17	1.5	81.5	Freight Cars

The alloys with Pb-base and high Cu-content behave just as well in cold as in hot state and with or without perfect lubrication. This is mainly ascribed to the high heat-expansion coefficient of the Pb which has the effect that the homogeneous mixtures of Cu or its alloys with Pb become the seat of a displacement of the Pb for each temperature difference and the more uniform this displacement, the more intimate the mixture. At the least temperature increase the direct contact or friction between the surfaces is therefore avoided as the Pb acts, so to speak, as lubricant. A number of tests are cited describing the experiences and behavior of bearings without any lubrication. Speeds up to 30 m./sec. and pressures up to 100 kg./cm.^{2} have been applied without any appreciable wear; the surface showed a fine polish. Ha (2)

Ordinary Bronzes and Special Bronzes. (Les Bronzes Ordinaires et les Bronzes Spéciaux.) LEON GUILLET. *Cuivre et Laiton,* Vol. 5, Mar. 30, 1931, pages 127-128.

The equilibrium diagram of binary Cu-Sn alloys is explained and compared with that of Cu-Zn. From 0 to 12% Sn the solid solution α exists, from 12 to 28% another constituent, δ, appears, Cu_4Sn. Between 28 and 32% are bronzes of pure δ formation. For industrial purposes, however, 2 groups of Cu-Sn alloys are used: bronzes up to 10% Sn, solid solution α, and bronzes 10 to 25%, built up of $\alpha + \delta$. The δ is hard and the hardness increases with the Sn content. The α-bronzes are used for their ductility and mechanical qualities, the $\alpha + \delta$ bronzes for pieces which have to stand friction, for bells and art pieces. The mechanical properties are described for each kind of bronze. The bronzes with 8 to 10% Sn have not yet been fully investigated. Ha (2)

Recent Developments in Zinc Die Castings. W. N. PEIRCE. *Paper* presented at 14th Annual Meeting of *American Zinc Institute,* St. Louis, Apr. 1932, 5 pages; *American Metal Market,* Vol. 39, Apr. 19, 1932, page 10.

The progress of Zn die castings made in recent years is reviewed. Especially have alloys low in Pb content been developed which are of great stability so that they can safely be used for gasoline motor parts, electric motor parts, telephone equipment with very narrow dimensional tolerances which formerly has been impossible. Impurities are almost excluded. The soundness of castings has been greatly improved. The porosity is the smaller the lower the temperature and the higher the pressure at casting. This produces also better material for electroplating. The possible extension of the fields for the application of Zn die castings and further developments are discussed. DTR+Ha (2)

Some Effects of Internal Stress on Properties of Drawn Brass Tubes. D. K. CRAMPTON. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 20 pages.

Tubes 0.75" in diameter were drawn from 1 lot of 70-30 brass. The final drawing operation varied with respect to reduction in diameter and reduction in wall thickness; the same die was used in the final draw for all tubes. The following tests were made: (1) tensile in which strength, elongation, apparent elastic limit and modulus of elasticity were determined, (2) Rockwell hardness, (3) time required to crack in $HgNO_3$ solution, (4) stress distribution by modified Fox method, (5) X-ray studies of orientation. Tubes were tested as drawn and after having received a relief anneal at 250° C. for 2 hr. Young's law of proportionality did not hold strictly as the modulus of elasticity was a maximum at zero load and decreased continually as the load increased. Relief annealing did not decrease strength, but it increased surface hardness when the stress released was tension. The time-$HgNO_3$ test gave a good indication of internal stress resulting from drawing or sinking. The method of determining internal stress did not yield precise values, but it did give some indication of the relative stresses resulting from various drawing schedules. Polycrystalline tubes showed stresses 29 to 55% greater than identically treated single-crystal tubes. When tubes are split the hardness of those surfaces that were under tension increases and that of those that were under compression decreases. In sunk tubes the orientation was such that a [112] direction was parallel to the tube axis, a [111] direction radial, and a [110] direction tangential. In drawn tubes a [111] direction was parallel to the tube axis, a [110] direction radial, and a [112] direction tangential. 12 references. JLG (2)

Monel Metal. N. C. MARPLES. *Nickel Bulletin,* Vol. 5, May 1932, pages 97-104.

The nature, mechanical properties of various qualities, the influence of cold-working and some applications of Monel metal are described and illustrated; its corrosion-resistance compares very favorably with Mn bronze; it is used for the filtering of liquids, pickling plant equipment, handling of beverages and foods, etc. Manufacturing methods and treatment are briefly described. It can be Ag soldered with a solder containing Ag 40%, Cu 40%, Zn 20%. Ha (2)

Alloys of Aluminum. GEORGE MORTIMER. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 69-74.

Practical applications of the results of research on causes of cavities are discussed. PRK (2)

Cadmium Bronze Trolley Wire Shows Desirable Qualities. *Transit Journal,* Vol. 76, Oct. 1932, pages 405-407.

Cd bronzes with higher annealing temperatures than Cu and higher conductivities than Sn bronzes are suitable material for trolley wire. Short circuit tests indicate that this material resists overloading better than hard-drawn Cu or Sn bronzes while resistance to mechanical wear is approximately the same. CBJ (2)

Directional Properties in Cold-rolled and Annealed Commercial Bronze. ARTHUR PHILLIPS & CARL H. SAMANS. *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 491, Oct. 1932, 12 pages.

Brass containing 90.08% Cu, 9.88% Zn, 0.012% Pb and 0.030% Fe was rolled to 0.032" sheet. 2 lots as finished were cold rolled to a 37% reduction, 2 others to a 56% reduction, and 1 other to a 75% reduction. One reduced 37% was given light reductions and light anneals, while the other was given light reductions and high-temperature anneals. Those rolled to a 56% reduction were given moderate reductions, while 1 was annealed at low and the other at high temperature. Tensile tests were made on specimens whose axis made angles of 0, 22.5, 45, 67.5 and 90° with the direction of rolling. Tests were also made on annealed sheets. The most pronounced directional properties were observed in the brass given the greatest reductions followed by high-temperature anneals. The tensile tests appeared to indicate whether or not the brass will form ears on drawing. In slightly and moderately worked brass, the lower the temperature of intermediate and next to the last anneals, the more marked are the directional differences as shown by tensile and cupping tests. Cu tends to form ears at 90° to the direction of rolling and 90-10 brass at 45°. The directional properties of Cu are decidedly different from those of 90-10 brass. 4 references. JLG (2)

Aluminum-Chromium Alloys. (Leghe alluminio-chromo.) G. GALLO & G. FRAGAPANE. *L'Aerotecnica,* Vol. 11, Dec. 1931, pages 1539-1554.

The influence of the Cr content on the corrosion resistance of Al alloys is determined. With Al-Cr alloys the percentage of Cr was varied from 0 to 6. A Cr content below 2% proved to be sufficient for noticeably altering the hardness and the resistance to corrosion. Cr, when added to duralumin, offers no improvement in the corrosion resisting properties. For testing the corrosion an apparatus developed by Tödt was used. GG (2)

Brass as a Material in Precision Machines. (Messing als Werkstoff in der Feinmechanik.) K. GROTEWOLD. *Feinmechanik und Präzision,* Vol. 40, June 1, 1932, pages 93-101.

The equilibrium diagram of Cu-Zn is explained, in particular that part with more than 52% Cu is discussed. This is of importance for the precision machine industries which use brasses of this range extensively. Brasses with more than 61% Cu consist, at normal temperature, of pure α-solid solutions, alloys of 61-54% Cu of α- and β-solid solutions and alloys of less than 54.3% of pure β-solid solutions. The structures of these 3 brasses are illustrated by micrographs. The mechanical properties of German standardized pressed and rolled brass are: tensile strength between 35 and 60 kg./mm.² according to whether they are soft, medium-hard or hard, elongation from 5-30%, and the Brinell hardness 75-145, so that a suitable material exists for almost any requirement. The heat or cold treatment is discussed; the stress cracks sometimes occurring in cold-worked metal can usually be eliminated by a heat treatment of 250° to 300° C. without impairing the hardness of the material. In order to find out whether such stresses are in the material that a crack could be expected at the further working of the piece the latter is placed in a solution of mercurous nitrate to which a few drops of HNO_3 are added for about 15 min. The immersed piece is covered with a thin film of mercury which penetrates into the grain boundaries. If stresses exist the piece will tear open after a few minutes; with weak stresses this happens after about 15 min. Articles which are subject to permanent vibrations should be made of annealed wires; hard brass often shows stresses developed by vibrations. Ha (2)

Studies on the Improvement of Alloys of the Gold-Platinum System by Small Additions of a Third Component (Studien über die Vergütung der Legierungen des Systems Gold-Platin durch geringe Zusätze dritter Komponenten). WILHELM GOEDECKE. Festschrift zum Fünfzigjährigen Bestehen der Platinschmelze (1881-1931). G. Siebert, G.M.B.H., Publisher, G. M. Alberti's Hofbuchhandlung, Hanau. Pages 100-107.

The author first reviews the Au-Pt system and the application of heat treatment to improving the properties of alloys containing 20% or more of Pt. It had been shown that 30% Au, 70% Pt alloy could be hardened to about 400 Brinell. The experimental work covers the effects of heat treatments of Pt-Au-Fe alloys containing up to 2% Fe on the hardness and electrical resistance. The alloys were quenched in water from 800-1000° C. and then reheated at 500 to 550° C. for different lengths of time. Hardness was measured with a 5 mm. ball and 250 kg. load. The hardness of the quenched alloys increased very slightly as the Fe increased to 2%. In a 10% Pt alloy the hardness of reheated alloys increased rapidly as the Fe increased to 0.1-0.2% (over 100%) with little change for larger additions. The time required to produce the maximum hardness decreased from 4 hours for 0.1% to about 10 min. for 1% Fe. Raising the reheating temperature shortens the time required to produce maximum hardening, but causes a more rapid loss in hardness on further heating. A maximum in the hardness of alloys containing 0.2% Fe was noted with 6% Pt. A break in the electrical resistance of a 10% Pt, 0.2% Fe alloy occurred at about 500° C. The experimental part is followed by some theoretical discussion of the mechanism of the hardening of Au-Pt-Fe by reheating after quenching. OEH (2)

Lanthanum and Its Alloys. (Le Lantane et ses Alliages.) G. CANNERI. *L'Usine,* Vol. 41, Apr. 22, 1932, page 27.

Alloys of La-Mg and La-Cu are briefly described. The addition of La seems to increase corrosion. See also "The Alloys of Lanthanum," *Metals & Alloys,* Vol. 2, Dec. 1931, page 298. Ha (2)

Magnesium Alloys. L. B. GRANT. *American Metal Market,* Vol 38, Dec. 3, 1931, pages 4, 10.

Paper presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys,* Vol. 3, June 1932, page MA 159. DTR (2)

Effect of Combinations of Strain and Heat Treatment on Properties of Some Age-hardening Copper Alloys. W. C. ELLIS & EARLE E. SCHUMACHER. *Transactions of the American Institute of Mining & Metallurgical Engineers,* 1931, pages 373-382.

See *Metals & Alloys,* Vol. 2, July 1931, page 126. (2)

Acid Resistant Bronzes. (Säurebeständige Bronzen.) W. CLAUS & H. FINCKE. Wilhelm Knapp, Halle (Saale), 1932. Paper, 6¼ x 9¼ inches, 136 pages. Price 13.80 RM.

Cu, with 0.08% Pb, 0.10% Ni, 0.03% Ag, 0.01% As and bronzes with 3½, 6, 10, 14, 20 and 32% Sn were studied, as cast, and annealed, in NH_4OH, HCl, H_2SO_4, H_3PO_4, sea water, Na_2SO_4, $NaHSO_4$, Na_2CO_3, $CaOCl_2$ and KOH solutions, the specimens being immersed in the solution at room-temperature and the closed container shaken. The results therefore are for relatively unaerated conditions. Corrosion was evaluated by weight loss, no study being made of change in physical properties. Some of the tests were carried on for 10 to 30 days. The results are plotted in 76 curves. Some cast Cu-Zn-Sn and Cu-Sn-Pb, Cu-Sn-Zn-Pb and Cu-Sn-Sb and Monel Metal were tested in similar solutions.

All the complex bronzes showed about the same degree of corrosion-resistance in each solution, irrespective of composition. Monel was slightly superior in NH_4OH, HCl and KOH. The results on the straight-Sn bronzes in the various solutions were about what would have been expected from previous work.

A bibliography of 724 references covering various other Cu base alloys besides bronze and other properties besides corrosion-resistance is appended. There is a name index to the bibliography. There is a table of contents, but no detailed index to the experimental part. H. W. Gillett (2)-B-

Some Useful Remarks on the Use of Copper Alloys. (Aperçu Utilitaire sur l'Emploi d'Alliages Cuivreux). A. Ricard. *Cuivre et Laiton,* Vol. 5, Apr. 30, 1932, pages 173-175.

The equilibrium diagram of Cu-Sn and the three distinguished quality ranges of bronzes up to 8% Sn from 8 to 14% Sn and above 14%, are briefly explained and the fields of application for each group stated. Ha (2)

Thermal Conductivity of Copper Alloys, II—Copper-tin Alloys; III—Copper-phosphorus Alloys. Cyril Stanley Smith. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 176-184.

See *Metals & Alloys,* Vol. 1, Dec. 1930, page 898. (2)

Production and Properties of Y alloy. (Herstellung und Eigenschaften der Y- Legierung.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 10, 1932, pages 282-283.

Discussion of the processing, properties and heat treatment of Y-alloy which is composed of 92.5% Al, 4% Cu, 2% Ni and 1.5% Mg and used in the automotive industry. GN (2)

The Composition of Manganese Amalgam and Manganese-Silver Alloys in Relation to the Electrode Potential of Manganese. Harvey D. Royce & Louis Kahlenberg. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 121-133.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 161. (2)

The Thermo-dynamic Activities in Binary Alloys. (Beiträge zur Kenntnis der thermodynamischen Aktivitäten in binären Legierungen.) C. Wagner & G. Engelhardt. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 159, Apr. 1932, pages 241-267.

The e.m.f. of galvanic cells built up by liquid alloys and molten salts are measured and the thermo-dynamic activities of the less noble component are determined with reference to the following systems: Pb-Bi, Sn-Bi, Tl-Bi, Mg-Pb. The data gained on the last system are uncertain due to the remarkable reactivity of Mg. The investigation of galvanic cells with alloys in the liquid state at elevated temperatures should be restricted to the nobler metals. The distribution coefficients and heats of mixture derived from activity measurements are compared with data experimentally determined. The applicability of the von der Waals equation of state with reference to binary alloys is discussed. The calculations of R. Lorenz and co-workers on the equilibria alloy-salt phase and on the equation state constants of the metallic phase derived therefrom are compared with the heat of mixtures of the alloys. Furthermore measurements are made on the e.m.f. of cells composed of solid alloys Ag-Au and Cu-Au, and of molten electrolytes for the temperature range of 666-1019° C. and 662-878° C. respectively. The experimental data can approximately be considered as equilibria potentials. EF (2)

The Hall Effect and Other Physical Properties of the Copper-Cadmium Series of Alloys. Wallace Richards & E. J. Evans. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Ser. 7, Vol. 13, Feb. 1932, pages 201-225.

Theoretical and mathematical study for the determination of the electrical resistivities, temperature coefficients of resistance, thermoelectric powers, Hall coefficients and specific heats and densities of this series. Tests were made on annealed specimens. RHP (2)

Higher Physical Limits of Monel Metal Forgings. *Inco,* Vol. 11, No. 2, 1932, page 21.

Yield points of over 70,000 lb./in.^{2} with an ultimate tensile strength of more than 90,000 lb./in.^{2} can now be obtained on forged bars from 3" to 6" in diameter with elongations higher than 25%. Ha (2)

Aluminium—Its Production, Properties and Applications. *Gas Journal,* Vol. 198, June 22, 1932, pages 826-827.

Describes a new brochure published by the British Aluminium Company, Ltd., King William Street, London. MAB (2)

Beryllium and Its Alloys. (Über Beryllium und seine Legierungen.) *Das Metall,* Supplement to *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 15, 1932, pages 204-206.

Survey on the properties and application of Be alloys, with special reference to Be bronzes. Be bronzes are superior to other bronzes due to better fatigue properties, higher resistance against corrosion, improved electric conductivity and heat conductivity and higher resistance to wear. Shaping of Be bronzes by drawing, rolling, pressing, stamping etc. offers no difficulties. GN (2)

Special Alloys. (Spezial-Legierungen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, page 334.

Composition, properties and uses of the following alloys are considered: Bobierre metal, Bolley metal, Bourbon metal, Bolster silver, Brazilian silver, Bourbouze solder metal, Bristol brass and Brix metal. The latter a corrosion-resistant alloy contains 15-20% Cr, 60-75% Ni, 5% Cu, 4% Si, 1-4% W, 2% Al and 3% Mn-Ti. GN (2)

Properties and Some Applications of Tungum Alloy. *Metallurgia,* Vol. 6, July 1932, pages 99-100.

Tungum is a corrosion-resistant Cu-base alloy that can be cast, forged, rolled, or extruded. Tables showing its resistance to various corroding media are given, but its approximate composition is not stated. JLG (2)

"Hydronalium," Light Metal of the German Dye Trust. ("Hydronalium" Leichtmetall der I.G. Farbenindustrie A.G.) *Zeitschrift für Flugwesen und Motorluftschiffahrt,* Vol. 23, Aug. 12, 1932, page 474.

The alloy corresponds to the alloy MG 7 manufactured in England by James Booth & Co., Ltd. The new alloy is lighter than duralumin and needs no improvement by aging. Parts to be joined are best riveted with the alloy MG 5 or "Hydronalium." Rivets made of other Al alloys are to be avoided. Butt-welding is possible by using "Autogal." Butt-welded plates show a tensile strength of 90% of the base plate. Machining of the alloy is easy with high speed. The tensile properties differ somewhat from those of MG 7. The following data are given:

	Yield Point lbs./in.^{2}	Tensile Strength lbs./in.^{2}	Elongation %
Pressed Semi-products	21300-28400	44100-49800	16-22
Soft sheets	21300-25600	44100-51200	16-22
Hard sheets	42700-51200	54000-61200	4-9
Medium hard sheets	.....	49800-56900	6-14

For other properties see *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 235. GN (2)

PROPERTIES OF FERROUS ALLOYS (3)

Comparative Investigations on Natural and Artificial Wrought Iron (Aston Iron). [Vergleichende Untersuchungen an natürlichen und künstlichem Schweissstahl (Aston Iron).] W. v. Gutmann & Hans Esser. *Mitteilungen aus dem Institut für Eisenhüttenkunde der technischen Hochschule zu Aachen,* Vol. 11, 1932, 5 pages; abstract, *Iron Age,* Vol. 129, Feb. 25, 1932, page 487.

See *Metals & Alloys,* Vol. 2, Dec. 1931, page 298. Ha + VSP (3)

Constructor and Material. (Konstrukteur und neuere Erkenntnisse der Werkstoffkunde.) O. Erlinghausen. *Der Bauingenieur,* Vol. 13, May 20, 1932, pages 281-285.

The paper first gives a survey on the development in Germany of new structural steels in recent years. The paper stresses the coöperation of constructor and material tester. It deals with the fatigue properties, the behavior of welded constructions, the resistance against corrosion of structural materials. GN (3)

Electric Steel. Thos. W. Hardy. *Iron & Steel of Canada,* Vol. 15, May 1932, pages 51-55.

The author classifies steels into 4 groups—common structural steels, tool steels, steel castings, and engineering steels—and deals briefly with each group. He then considers very completely the chemical and physical control of the basic electric process, illustrating his points by means of examples. The value of the McQuaid-Ehn test in elucidating the physical characteristics of steel as distinguished from its chemical is dealt with in considerable detail. OWE (3)

Effect of Annealing on the Torsion Strength of Cast Steel. (Einfluss des Glühens auf die Drehschwingungsfestigkeit von Stahlguss.) B. Garre & E. Grathoff. *Stahl und Eisen,* Vol. 52, May 19, 1932, page 493.

Cast steel containing 0.18% C, 0.25% Si, 0.4% Mn, 0.07% P and 0.07% S was tested after 20 minutes annealing at various temperatures. Results are tabulated herewith:

Annealing Temp. °C.	...	500	700	800	900	1000
Torsion Strength kg./mm.^{2}	10.0	10.6	10.8	11.0	14.0	15.0
Increase %	0	6.0	8.0	10.0	40.0	50.0
Tensile Strength kg./mm.^{2}	38.3	39.3	40.5	40.8	43.0	43.7
Increase %	0	2.6	5.8	6.5	12.3	14.1
Ratio $\frac{\text{Torsion Strength}}{\text{Tensile Strength}}$	0.26	0.27	0.27	0.27	0.32	0.34
Elastic Limit kg./mm.^{2}	19.6	20.6	20.2	21.0	25.4	25.6
Increase %	0	5.1	3.1	7.1	29.6	30.6
Elongation %	15.9	16.7	24.6	24.3	22.7	25.4
Increase %	0	5.0	54.7	52.8	43.1	59.8
Notch Strength mkg./cm.^{2}	1.29	1.26	1.33	1.40	4.74	5.97
Increase %	0	-2.3	3.1	8.5	267.5	363.0
Brinell Hardness	115	112	113	114	117	121
Increase %	0	-2.6	-1.7	-0.9	1.7	5.2

Naturally with the short annealing period of 20 minutes the maximum improvement in structure of the metal was not attained at 900° C. as could be expected from the Fe-C equilibrium diagram. DTR (3)

Nickel Cast-Iron, Wear and Machinability. (Nickelgusseisen, Verschleiss und Bearbeitbarkeit.) E. Piwowarsky & H. Nipper. *Mitteilungen aus dem Giesserei-Institut der Technischen Hochschule Aachen,* Vol. 2, Oct. 1931, 1 page.

A test between 2 pieces of cast Fe of the same chemical analysis, except that one contained 1.1% Ni in addition, showed clearly a difference in wear and hardness in favor of the nickel Fe, both for dry and green sand casting. The hardness increased from 183 to 197 and 199 to 207 respectively in the 2 methods while the wear was reduced to about 1/2 to 1/3 when tested with the Amsler method. Other test methods did not show a pronounced difference. Ha (3)

A New 18 and 8 Free-Machining Steel with High Sulphur. *Iron Age,* Vol. 129, Jan. 21, 1932, page 247; *Steel,* Vol. 90, Jan. 18, 1932, page 26.

The steel was developed by Carpenter Steel Co. It is known as Carpenter stainless steel No. 8. Its composition is between 7 and 30% Cr and .15 and 1.80% S, and is characterized by anti-friction qualities. It is also corrosion resisting. VSP (3)

Alkali-Proof Cast Iron. (Laugenbeständiges Gusseisen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, June 12, 1932, page 321.

Brief mention of a new alkali-proof cast iron. According to investigations by Piwowarsky cast iron can be made alkali-proof by the addition of from 0.1-0.6% Sb. Higher additions of Sb impair the mechanical properties. The new cast iron is patented. (German patent 543,562). GN (3)

New Corrosion-Resisting Steel Contains Chromium, Copper and Silicon. *Steel,* Vol. 90, Mar. 14, 1932, page 34.

Announcement of a new, patented, corrosion-resisting alloy steel, Nevastain RA. This steel has a maximum C content of 0.10%, P and S 0.030%, Mn 0.40%, Cr 16%, Si 1% and Cu 1%. This steel can be cold rolled, drawn, machined and welded and can be used in place of any other types of corrosion-resisting steels. JN (3)

New Data on Alloy Steels Brought Out by Research. *Steel,* Vol. 90, Feb. 29, 1932, page 30.

A discussion of the various papers on alloy steels delivered at the annual meeting of the American Institute of Mining & Metallurgical Engineers in New York, Feb. 15-18, 1932. JN (3)

Develops Chrome—Vanadium Steel with Good Properties for Nitriding. *Steel,* Vol. 90, Feb. 1, 1932, page 37.

The properties and advantages of a new Cr-V nitriding steel containing 0.50-2.50% Cr, 0.30-2.00% V and up to 0.70% C are discussed in technical bulletin No. CV-1, entitled "Chrome-Vanadium Nitriding Steel," issued by the Electro Metallurgical Co. of New York. JN (3)

Black Heart Malleable Fittings. (Schwarzguss-Fittings.) W. Hartung. *Gas und Wasserfach,* Vol. 75, May 7, 1932, pages 359-362.

The author advises the use in Germany of black heart malleable instead of white heart malleable for fittings. In the discussion the opinion of the author as to a greater economy of black heart malleable for German conditions is refuted. GN (3)

The Technical Treatment of Pulverized Carbonyl-Iron by the Sintering Process. (Die technische Verarbeitung von pulverförmigen Carbonyleisen nach dem Sinterverfahren.) F. Duftschmidt, L. Schlecht & W. Schubardt. *Stahl und Eisen,* Vol. 52, Sept. 1, 1932, pages 845-849.

Report of Oppau Research Laboratory of the I.-G. Farbenindustrie. The manufacture and use of powdered metals and metallic molded articles prepared by the sintering process is a comparatively new field of progress. Carbonyl Fe, especially, lends itself to this newly-developed process. Two properties make carbonyl Fe so suitable, (1) unusually high compressibility of the powder, and (2) its uniformly distributed amounts of C and O. Content of O_2 in carbonyl Fe powder should run from 1 to 2%, and C about the same. The sintering, carried out at 1100° C. for 4 hrs., produces a carbonyl refined Fe material of very high deep drawing qualities. Erichsen indentation tests show this material to be superior to Cu. Carbonyl Fe alloys may be produced similarly. The alloying constituents desired must be added in powdered form to the carbonyl Fe before sintering. The powdered alloys desired may be added either in their metallic state or as oxides. Any type of heating furnace may be used for the sintering, since it is not necessary to maintain a specially protecting atmosphere. The C and O in the carbonyl Fe are converted, by the reactions taking place during the sintering, into CO and CO_2. The mechanical and magnetic properties of pure carbonyl Fe are given as follows:

Elastic limit	11 to 17 kg./mm.²
Tensile strength	20 to 28 kg./mm.²
Elongation	40 to 30%
Brinell hardness	56 to 80
Modulus of elasticity	2,070,000 kg./cm.²
Notch toughness at 20° C. (Dimensions of sample 10x10x10 mm., fracture cross-section 10x5 mm., notch diam. 1.3 mm.)	16 to 20 mkg./cm.²
Conductivity	0.1×10^{-4}
Temperature coefficient of electrical resistance	0.65
Coercive force	0.08 gauss
Permeability μ_0	3,000
Permeability μ_{max}	20,000
Remanence	6,000
Magnetic saturation	22,000

DTR (3)

Low-carbon Steel. H. B. Pulsifer. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 347-377.

Includes discussion. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 298. (3)

Hollow Drill Steel. Roy H. Davis. *Canadian Mining Journal,* Vol. 52, Aug. 1932, pages 356-359.

The design of the bit and the efficiency of the heating and hardening have a direct bearing on the drilling performance. The proper temperature for forging depends largely upon the speed of the sharpener and the operator's skill. Forging should be completed as close as possible to the critical temperature. It must be completed before the lower limit of the critical temperature is reached. A table shows the % weld life on samples of drill steel that have been used until a third failure has occurred. They show that it is not economical to weld up broken steel drills. WHB (3)

The Magnetic Properties of Perminvars. (Ueber die magnetischen Eigenschaften der Perminvare.) H. Keuhlewein. *Wissenschaftliche Veröffentlichungen aus dem Siemens-Konzern,* Vol. 10, Mar. 1931, pages 72-88.

The property of the perminvar materials—that is the constancy of the original permeability up to comparatively high magnetizing fields—which makes them so valuable in the construction of instruments is not yet fully explained. The following results can be stated as certain: (1) The different shapes of the hysteresis loops of perminvars all form a continuous series; (2) an increase of the perminvar character in the Elmen perminvar range can be obtained either by a greater content of Co or by annealing at higher temperature; (3) hysteresis loops of perminvar character can be obtained only if the cooling after annealing goes on very slowly; (4) in the system Fe-Ni-Co another perminvar range exists besides that of Elmen which lies very close to the Fe-Ni series; (5) the more pronounced the perminvar character of an alloy is the more difficult it is to demagnetize it; some kinds can be demagnetized only by annealing. 7 references. Ha (3)

The Relation of the Magnetic Properties, especially of the Coercive Force, to the Structure of Alloys and the Development of New Kinds of Magnetic Alloys. (Ueber die Beziehungen der magnetischen Eigenschaften, insbesondere der Koerzitivkraft zum Gefügeaufbau der Legierungen und die Entwicklung neuartiger Magnetlegierungen.) Werner Köster. *Zeitschrift für Elektrochemie,* Vol. 38, July 1932, pages 549-553.

2 important kinds of magnetic properties of metals are represented by a very narrow and a very wide magnetization loop. Homogeneous solid solutions produce the first type, heterogeneous alloys, the second type. In the latter alloys form and size of the structural elements, in addition to the quantity, are determining. The finer the distribution the more difficult becomes the reversal of magnetization. A very fine and uniform distribution can be obtained by precipitation of a phase dissolved in excess during tempering; this treatment can be applied to all ferromagnetic alloys for which the solubility of a phase existing at room temperature for another type of crystal increases with increasing temperature. The magnetization loop is widened to a maximum during the precipitation of the crystal dissolved in excess and is then narrowed again. The regularities observed for Fe-C alloys were confirmed for many other systems of alloys. By systematic experiments and evaluation of the diagrams of state new kinds of magnetic alloys could be developed, containing W, Co, Mo, etc. The heat treatment to develop the best results is given for every case. Ha (3)

The Notch-Toughness of high-grade Structural Steels. (Beitrag zur Kerbzähigkeit hochwertiger Baustähle.) F. Roetscher & M. Fink. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Feb. 20, 1932, pages 173-177.

The mechanical properties of 5 (German) structural steels and their compositions are given; the notch-toughness was determined in annealed and aged condition in the temperature range from −190° to +500° C. The measuring methods are described. Thomas and open-hearth steel in general show the same behavior but the latter has a better performance at lower temperatures and is less sensitive to aging and cold working than Thomas steel. The notch-toughness of all 5 steels drops at −180° to −120° C. below 1 mkg./cm.² Cu-Mn-Si steel is superior to open-hearth steel at temperatures from −100° to −10° C. Ha (3)

High Capacity Free Cutting Steel for Peak Requirements. (Hochleistungsautomatenstahl für Spitzenleistungen.) F. Schmitz. *Zeitschrift für wirtschaftliche Fertigung,* Sept. 1932, page We 16.

Properties and application of 3 new free cutting steels are discussed. Lardo-N with about .20% S and tensile strength of 45-60 kg./mm.² is a rimming steel to be machined with cutting speeds of from 70 to 85 m./min. Since rimmed steels tend to ingot segregation Lardo-Extra (S about .20%) was developed which is free from this defect but cuts only with 50-60 m./min. Lardo Superior contains between .35-.40% S, cutting speed in as delivered state 60-80 m./min., in drawn state 70-90 m./min. The latter steel has excellent machining properties, is best fit for case carburizing and has tensile properties not inferior to steel St. 16.61. GN (3)

New Development of Chromium-Tungsten Steel for Oil-Refining Service. V. T. Malcolm. *Transactions American Society of Mechanical Engineers,* Vol. 54, Mar. 30, 1932, Petroleum Mechanical Engineering, pages 15-25.

A series of tests are described in the development of properties required of a steel for high-temperature construction and service as used in oil-refining service. Besides strength and corrosion resistance factors which must be considered are thermal expansion, thermal conductivity, resistance to abrasion, scaling and oxidation. A Cr-W steel was tested in these respects and gave very satisfactory results. Ha (3)

Quality Cast Steel. (Qualitätsstahlguss.) Adolf Lincke. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 24, 1932, pages 283-284.

After a brief survey on the production of quality cast steel in the acid and basic open hearth furnace the author describes a special method for making quality steel in the Bessemer converter. In order to decrease the S content in the Bessemer charge, the cupola has a basic lining and the pig Fe is melted down in the cupola with a highly basic slag. The P content in the cupola charge is chosen as low as possible. Steel made according to this process shows, for instance, the following composition: C: .25%, Mn: .80%, P: .03-.04%, S: .01-.04%. Tensile strength: 64000-78200 lbs./in.², elongation: above 24%, reduction of area: up to 30%. The results of practical charges and tests are tabulated. There finally is emphasized the importance of the electric furnace for quality steel production. GN (3)

The Yield Point of Mild Steel. C. W. MacGregor. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 187-200.

The yield point of mild steel has been investigated under different conditions of the test piece, velocity of stressing, type of head, different kinds of cross sections and grooves on the surface. Small scratches and grooves perpendicular to the bar axis do not appreciably affect the upper yield point, but grooves placed at 45° to the axis of the bar result in a quite different shape of the strain-stress curve and reduce the upper yield stress greatly. Results are shown in detail. Ha (3)

Nickel-chromium-silicon Cast Irons. A. L. Norbury & E. Morgan. *Iron & Steel Institute, Advance Copy* No. 9, Sept. 1932, 14 pages.

A new austenitic cast iron named "Nicrosilal" that has exceptional resistance to scaling and growth was developed. It contains 18% Ni, 6% Si, 2% Cr, 1.8% total C, and 1% Mn. The iron is ductile and not inclined to crack on sudden heating or cooling. It differs from "Ni-resist" chiefly in that it contains more Si. It can be melted in the cupola and cast into sections less than ⅛" thick. It is easily machinable and has an electric resistance of 160 microns/cm.³ Its corrosion resistance can be increased by the addition of Cu. The results of many mechanical, dilatometric, and growth tests on irons containing various amounts of Si, Ni, Cr, and C are given. From these results it was concluded that the most satisfactory iron had the composition listed above. JLG (3)

Iron from Cupola Furnace Comparable to Steel. (Fonte au Cubilot Comparable à l'Acier.) *Revue de Fonderie Moderne,* Vol. 26, Aug. 25, 1932, pages 276-277.

Fe with only 2.5% C was obtained which showed a behavior almost like steel or malleable Fe, in structure as well as in physical properties. Ha (3)

Impact Tests on Notched Bars. (Essais au choc sur barreaux entaillés.) R. Zoja. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 356-364.

The specifications of the Italian Railways as to impact figures on different classes of steel are listed. For the study of aging embrittlement after deformation, instead of deforming an impact specimen by compression as has been done by other workers, Zoja suggests subjecting it to impact in the Charpy machine sufficient to deform it to the desired degree but not to break it, then age it by heating to 200°-300° C. and break it in the Charpy machine. Plotting kg.-m. work of fracture against percentage deformation and using enough specimens, characteristic curves are obtained. In typical curves shown, one readily aging steel begins to show 2 sets of values, one high and one low, belonging to 2 different curves of opposite slope, at only 3% deformation, while a difficultly aging steel only begins to show this dispersion at 30% deformation. The slope of the curves for brittle behavior is quite similar in both cases, but those for tough behavior are very different. HWG (3)

Heat-Treatment of Chrome-Moly after Welding. WILMER E. STINE. *American Machinist,* Vol. 76, Feb. 4, 1932, page 163.

Cr-Mo steel used for airplanes has approximately the following analysis: C 0.25-0.35; Mn 0.40-0.60; P 0.040 max.; S 0.045 max.; Cr 0.80-1.10; and Mo 0.15-0.20. The U. S. Army requires a minimum tensile strength of 125,000 lbs./in.^{2} Welding tends to reduce the tensile strength. This was overcome by heat treating as follows: normalize to 1,650°-1,750° F. and cool slowly in furnace below red heat, heat to 1,550°-1,625° F. and quench in light oil, draw at 950° F. Tables are given showing the increase in strength due to heat treatment. The increases are generally more than double. RHP (3)

The Magnetic Properties of Iron, Nickel, Cobalt and a few Alloys at higher Temperatures. (Die magnetischen Eigenschaften von Eisen, Nickel, Kobalt und einigen Legierungen bei höheren Temperaturen.) H. KUEHLEWEIN. *Wissenschaftliche Veröffentlichungen aus dem Siemens-Konzern,* Vol. 11, Mar. 1932, pages 124-140.

Fe, Ni, Co and several alloys, namely 1.95% Fe, 5% Ni, 2.90% Fe, 10% Ni, 3.45% Ni, 30% Fe, 25% Co, 2.50% Fe, 50% Co and some hexagonal Co alloys, were magnetically examined at high temperatures. The existence of 2 Curie points could be confirmed for Fe, Ni and one cubic face-centered Fe-Ni-Co alloy; the paramagnetic Curie temperature is here always higher than the ferromagnetic Curie temperature. The reverse could not be found; the magnetic transformation is identical with the A_3 transformation. It can be demonstrated on hexagonal Co alloys that the transformation of the hexagonal lattice in face-centered cubic lattice and vice versa can be influenced by an exterior field. Ha (3)

Malleable Cast Iron. (Der Temperguss.) E. SÖHNCHEN. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Mar. 20, 1932, pages 115-117; May 1, 1932, pages 178-180; May 29, 1932, pages 216-217.

This is a comprehensive review of the properties of malleable cast Fe. The first installment deals with the tensile properties and refers to the tensile test, the bending test, hardness and notch toughness. The tensile strength, and elongation of German malleable cast iron made according to the various methods are given as follows:

Type of malleable cast iron	Tensile Strength lbs./in.^{2}	Elongation %
White heart malleable:		
Cupola (A)	66 000	5.4
Cupola (B)	60 150	6.3 (transition to black heart)
Crucible	61 300	6.3
Open hearth	61 150	5.9
Open hearth	74 250	3.3 (for special purposes)
Electric furnace	71 750	6.5 (partially black heart)
Black heart malleable:		
Reverberatory furnace, oil fired	51 750	12.0
Open hearth furnace	56 600	11.1
Cupola	54 050	10.9
Brackelsberg furnace	63 150	19.1 (special malleable)

The second installment discusses the technological properties of malleable cast Fe. A great disadvantage of black heart malleable is its sensibility to temperature which is already observed in temperature ranges between 400°-500° C. Difficulties are encountered in hot galvanizing black heart Fe (at about 500° C.). The casting becomes hard and brittle just at these temperatures. This difficulty can be eliminated by heating to 650 and quenching before hot galvanizing. The pronounced temperature dependence of black heart malleable can be utilized for an improvement of the otherwise low tensile strength and low resistance to wear. This is done by a suitable heat treatment, heating to about 760° C. and subsequent quenching in oil or water so that any property desired can be obtained. The hardenability of white heart malleable depends on the C content. Black heart malleable can be better riveted than white heart malleable. Welding of malleable cast Fe needs great experience and skill. Welding practice and results are discussed. Machining offers no difficulties. Data on specific gravity and shrinkage are given. The 3rd and last installment of the author's paper on the properties of malleable cast Fe deals with special physical and chemical properties. Since malleable cast Fe has a low magnetic hardness it is used in electro-machine construction for armatures, pole shoes, etc. Malleable cast Fe has excellent properties against chemical attack (water, gases, influence of the weather). The paper finally deals with the effect of C, Si, Mn, P and S on the mechanical properties. A low content of total C favorably affects the properties as is shown for the notch toughness in the table below. A maximum of toughness, elongation and machinability is attained when practically no combined C is present. Si favorably affects the malleablizing process and increases the density. Though P impairs the toughness this effect is the less pronounced the lower the content of combined C. A moderate S content hinders the precipitation of graphite in the raw casting and retards the formation of temper carbon during the malleablizing process. The impairing effects of a higher content of S should not be overestimated.

Notch Toughness in Dependence on Combined Carbon

Notch Toughness mkg./cm.^{2}	Total Carbon %	Temper Carbon %	Combined Carbon %
17.0	.71	.49	.22
14.4	.78	.44	.34
12.2	.96	.51	.45
11.6	.98	.30	.68
10.6	1.11	.51	.60
9.7	1.16	.41	.75
8.2	1.14	.24	.90
7.2	1.42	.50	.92
5.6	1.63	.33	1.30
4.1	2.04	.38	1.66

GN (3)

Malleable Iron Castings, Their Design and Physical Properties. J. H. LANSING. *Journal Society of Western Engineers,* Vol. 37, Apr. 1932, pages 104-109.

Outstanding properties of malleable Fe include: (1) the structural composition of the original hard Fe castings consists of pearlite and cementite, (2) primary graphite is rarely present, due to a better adjustment of the C and Si content, (3) the castings are poured at a temperature permitting sharp definition and an excellent surface, as well as affording freedom from occluded gases, (4) the white Fe castings are coarse-grained, hard and brittle, and as a necessary subsequent part of this manufacture they are subjected to a heat treatment or conversion process whereby the original characteristics are changed to the exact opposite—tough and strong, (5) the structural composition of the annealed castings is made up of a matrix of ferrite throughout which are uniformly distributed nodules of free C, (6) the finished product is tough, ductile, highly shock-resistant, and due to the temperature at which the conversion process is carried through, and as a result of the slow cooling from this temperature, the castings are fine-grained and free from internal strains, (7) these inherent properties made for ease of machining, and (8) due to their structure and freedom from strains, malleable Fe castings have remarkable corrosion-resistant properties. Average properties of higher strength malleable Fe are tabulated. 17 factors to be considered in the designing of malleable Fe castings are listed. WHB (3)

A New Automotive Steel. *Vancoram Review,* Vol. 3, Apr. 1932, pages 51-54.

A composition named "Normalloy" containing Mn in proportions higher than are usual in simple C and most low-alloy steels and containing in addition effective though small amounts of V, and in some instances other elements, is distinguished by its most satisfactory adaptation to normalizing treatment. This steel is used for locomotive and similar forgings of large size in which high strength and dynamic properties are required and for which quenching and tempering operations can not very well be carried out on account of mass or are not permitted due to residual quenching stresses. Such steel of an average composition of 0.47 C, 0.75 Mn and 0.16 V in forgings showed the following results:

No.	Yield Point lbs./in.^{2}	Tens. Str. lbs./in.^{2}	Elong. % in 2"	Red. area %	Izod ft.-lb.	Brinell Hardness
1	73,900	120,250	19.5	48.4	12.0	235
2	77,200	113,150	20.0	47.6	16.5	219
3	76,700	117,700	19.5	46.1	12.5	237
4	79,700	119,350	20.0	45.6	12.8	237

The same uniformity was also shown in the microphotographs of the grain structure, and in samples of thick pieces (7") whether taken from core or edge. Ha (3)

Theory and Practice. (Wetenschap an techniek.) A. VOSMAER. *De Gieterij,* Vol. 6, June-July 1932, pages 64-65.

Although cast iron may be considered as an inferior metal it constitutes a third of the world production of ferrous metals and its cheap price and its ease of manufacture make it a very desirable metal in many cases where more expensive metals would present better qualities. The relatively low fusion point, the great workability, the ease of molding makes it very practical. Besides the common cast Fe a special grade called "hartguss" has been in use for years where hardness is desired. But since the rapid development of the special steels (Ni, Ni-Cr, high Si, Cr, Mn) the effect of adding the same metals to cast Fe have been considered. The author refers first to the Si additions which increase the acid resistant qualities by the separation of C in graphite form while additions of Mn would have the opposite effect. He first shows that at about 10% Si the cast Fe called by different trade names (Tantiron, Duriron, metalline, corosiron, etc.) is very highly acid resistant. The Ni and Cr additions are then examined and first Ni additions are shown to have an effect similar to Si though not as simple. Certain proportions of Si destroy the favorable effect of Ni additions. The amount of Ni must be greater than 0.5% to show its effect. At 3% Ni the metal has a very fine structure, from 3 to 10% the hardness increases rapidly to become a maximum at 10% where the metal has a Brinell hardness of 300 instead of the normal Brinell number of 150 to 180. At about 20% Ni the metal is practically resistant; it must be noted here that in the Ni steels the same result is only attained when 25% Ni is used, to give it the "rustless" character. It is also interesting to note that for low percentages of Ni the cast Fe presents remarkable alkali resistant qualities while more than 5% are better suited for acid resistant cast irons. The simultaneous addition of Cr and Ni makes the metal yet more acid resistant but due to the scarcity of the Cr ores this material is very expensive. Another fact makes this yet worse, the addition of Cr to cast Fe to become effective must be higher than for special steels. While the percentage of Ni is smaller by 5% than for rustless steel the percentage of Cr must be higher than 30% to enhance the special qualities while for steel lower percentages are sufficient. The *Krupp'sche Monatshefte* for Dec. 1931 shows that more than 30% are absolutely necessary. Additions of a certain % of Cu with Cr and Ni seems to better the quality at a lower cost. Time will tell about the future of all these special cast irons in competition with special steels. A very remarkable metal of which the author gives the composition but not the trade name would be composed as follows: 2.3% C, 1.4% Si, 0.4% Mn, and 34.2% Cr which shows the very special characteristics that while all other ferrous alloys show at 500° C. about half the traction resistance shown at 20° C., this alloy shows 41.1 kg./mm.^{2} at 20° C. and 46 kg./mm^2 at 500° C. At 600° C. however this resistance decreases to 28.5 kg./mm.^{2}. Its hardness is 300 Brinell. The heat resistant qualities as well as the alkali, acid and salt resistant qualities referred to are mostly interesting to the chemical industry. It is only regrettable that while 15% Cr imparts these special qualities to steel, 34% are necessary for cast Fe. MPW (3)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)

Study of the Corrosion of Iron and Its Alloys. (Etude sur la Corrosion du Fer et de ses Alliages.) T. Levoz. *Revue de Fonderie Moderne,* Vol. 26, June 10, 1932, pages 188-192.

In order to produce an iron or iron alloy which can be used as a base for rustless steel the primary material should be as free of O as possible. The author describes a cupola furnace of his invention where he can produce such Fe and steel without O or other gas enclosures. He distinguishes between plants which use only secondary or remelts and those which melt the raw materials, and gives the composition of the charges for the furnaces and for the converters, and also the temperatures at which to work. The addition of 0.3 to 5% Cu improves the quality of the Fe. Side blowing in Thomas converters is advised. Although Cu is a good anti-corrosive, Cu and Fe do not combine easily and alloy often rather irregularly. Temperatures higher than 1650° C. should be used and the customary reducing agents employed. With this iron, alloys with Ni, Cr, U, W, Co can easily be obtained. Ha (4)

Corrosion Resistant Alloys of the Stainless Type in Use and Fabrication. T. Holland Nelson. *Year Book of the American Iron & Steel Institute,* 1931, pages 171-217.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 246. (4)

A Peculiar Type of Corrosion in Chrome-Nickel Austenitic Steels (Un mode particulier de corrosion des aciers austenitiques au chrome-nickel). A. Sanfourche & A. Portevin. *Comptes Rendus,* Vol. 194, May 17, 1932, pages 1741-1743.

The authors point out that austenitic steel of the 18/8 type, which has been shown to be unaffected by cold phosphoric acid (*Comptes Rendus,* Vol. 192, 1931, page 1563, and Vol. 193, 1931, page 53) is rapidly corroded if this acid contains HCl even in small amounts. Systematic study of the effect of this factor has brought out certain interesting peculiarities. In general, it requires less HCl to cause attack when concentrated H_3PO_4 is used. In 100 cc. of 35° Bé solution 0.5 cc. of HCl suffices to start an accelerating action which terminates in the complete destruction of the alloy. This, however, only corresponds to the very small ratio HCl/H_3PO_4 of 1/625, which shows that HCl is continually liberated as a result of the reaction of the chlorides already formed with the H_3PO_4. Another point brought out is that with low concentrations of phosphoric acid (30° Bé) the surface condition of the sample appears to have no influence upon the attack; this, however, is no longer true with 53° Bé acid. The behavior of austenitic steel in 60° Bé acid containing 0.5 cc. HCl (HCl/H_3PO_4 = 1/790) has been studied very closely, using as standards both the loss of weight of the alloy with time and the variations of its potential relative to a hydrogen electrode submerged in the corroding medium. 3 periods of corrosion were distinguished by this means—(1) a period of initial passivity during which the e.m.f. increased to 0.10-0.12 v., while the loss in weight of the sample was almost nil; (2) a period during which the e.m.f. rose precipitately to 0.22-0.24 v., then fell fairly quickly to 0.20-0.22 v., and finally, more slowly, to 0.18-0.19 v., while the loss in weight of the steel increased linearly relative to time; (3) a period during which attack ceased just as abruptly as it began; this period opened with a sharp drop of potential from 0.18-0.19 to 0.12-0.14 v. The results of these studies are embodied in a diagram in which, however, the time scale is not graduated, since the time at which the second period commenced varied with the state of the sample. In samples previously pickled in HCl the initial period of passivity was 2 hr., while in a sample previously sandpapered the initial period of passivity was 6¾ hr. The second period, that of attack, did not appear to be related in length of time to the initial state of the sample; it varied in length from 24 to 40 hr. The loss of weight per sample per hour, however, was definitely affected by the condition of the sample. In the case of sanded samples the loss in weight was 0.55 mg./cm.^{2}; in the case of pickled samples, 0.85 mg./cm.^{2}. At the commencement of the third period the solution assumed a strong green color and the alloy became coated with a black layer of double carbide of Fe and Cr. The formation of this carbide is opined by the authors to be responsible for the cessation of attack of the steel, its appearance and that of the second period of passivity coinciding. The authors noted that if attack of the samples was interrupted, the samples being then washed and dried, passivity was once again conferred upon them. The paper closes with a brief résumé of the authors' findings. OWE (4)

The Painting of Railway Structures and Equipment. H. E. Smith. *Industrial & Engineering Chemistry,* Vol. 23, Dec. 1931, pages 1343-1346.

Buildings, steel bridges and freight cars, passenger cars and locomotives are discussed from the standpoint of protective and decorative coatings. Some of the materials used for coating the steel work are listed. MEH (4)

Recent Progress in Rust-Proofing Steel Pipes and in the Protection of Pipe Joints. (Fortschritte in Stahlrohrisolierung und im Schutz der Rohrverbindungsstellen.) Weckwerth. *Das Gas- und Wasserfach,* Vol. 75, Jan. 23, 1932, pages 69-73.

Investigations made by the Vereinigte Stahlwerke show that pipes with protective covering are able to resist the highest stresses and most severe working conditions. In general, it may be said that the results indicate that pipes with this protective insulation will resist every kind of injury that may be sustained during transportation, operation and storage. After a research covering a period of 4½ years, the Mannesmann-Roehrenwerke succeeded in finding an anti-rust agent to resist chemical and mechanical attacks by acids, alkalies, hydrocarbon gases, salts and other elements found in the soil and known for their corrosive effects. MAB (4)

Machine Tests Corrosive Action. *Power,* Vol. 75, May 3, 1932, page 661.

An apparatus for alternately immersing a solid in a liquid and exposing it to the air is briefly described and pictured. AHE (4)

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Corrosion Protection by Chromium Plating and Testing Methods Therefor. (Korrosionsschutz durch Verchromung und dessen Prüfungsmethoden.) H. Leiser. *Metallwaren Industrie und Galvano-Technik,* Vol. 29, Oct. 1, 1931, pages 431-432.

Cr itself does not warrant any rust protection. Flawless, thick intermediate layers are required. The total thickness of all layers should be 0.025 mm. Testing methods for absence of pores are considered, namely (1) "Ferroxyl" reagent, (2) Cu plating in acid electrolyte at low currents. Cu is deposited in pores and flaws. Spots which are not Cr plated can also be recognized by dipping the object into a solution containing 150 g. $CuSO_4$ + 10 cc. H_2SO_4/ 1,000 cc. H_2O. The salt spray test, which might also be employed, is described. EF (4)

Corrosion Protection of Marine Turbines. (Über den Korrosionschutz von Schiffsturbinen.) H. Maseille. *Farben Zeitung,* Vol. 36, May 16, 1932, page 1476; *Peintures, Pigments, Vernis,* Vol. 8, Mar. 1931, pages 1453-1457.

The main causes of the corrosion of marine turbines, are the presence of moisture, salt water and heat while standing idle. In addition to this, local currents occur due to the presence of different structural metals. Utilization of corrosion resistant alloys did not prove successful. The French Navy obtained some good results on paints containing Al or graphite. The best way of preventing corrosion is to keep salt water out of the turbine and to keep the latter dry during periods of idleness. EF (4)

From Empirical to Fundamental Facts of Corrosion. (Vom Empirischen zum Grundsätzlichen beim Einzelfall der Korrosion.) G. Masing. *Feinmechanik und Präzision,* Vol. 40, Mar. 1, 1932, pages 53-54.

See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 291. Ha (4)

Investigations on Corrosion by Water Impingement. (Untersuchungen über Korrosion durch Wasserstoss.) J. Ackeret & P. de Haller. *Schweizerische Bauzeitung,* Vol. 98, Dec. 12, 1931, pages 309-310.

Preliminary report of tests on the resistance of materials to mechanical-hydraulic erosion. According to a method by Honegger (*B B C Nachrichten,* Vol. 14, 1927, page 95) the sample is attached to a rotating disk and thrown against a water jet parallel to the wheel axis. Jets 1 cm. in width were used. At a jet velocity of 50 m./sec. medium hard open hearth steel was considerably eroded after 5,000,000 impacts. The investigations give an interesting outlook on the causes of erosion by real cavitation. GN (4)

Corrosion of Water Heaters. (Rosterscheinungen in Boilern.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Oct. 19, 1932, page 559.

Discussion between Bauerfeld and the authors of the former publication on the above subject in *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Sept. 4, 1932, pages 465-466. Bauerfeld thinks proper Zn coating of prime importance for the avoidance of such failures, but Daeves and Grosschupff do not believe this to be correct. GN (4)

Remarkable Damage of the Walls of a Boiler Through Feed Water. (Bemerkenswerte Beschädigungen der Wandungen eines Dampfkessels durch das Speisewasser.) *Zeitschrift des Bayerischen Revisionsvereins,* Vol. 36, Feb. 29, 1932, pages 36-37.

The heavy corrosion of the boiler walls was found to be due to the feed water having been polluted by HCl. GN (4)

Thinly Liquid Aluminum. (Dünnflüssiges Aluminium.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Sept. 25, 1932, page 508.

Brief description of a highly effective rust preventer, and protection against flue gases, in which Al flakes are mixed with a binding compound (composition not given). The new coating compound "Storal" which also has excellent properties against friction, pressure, shock, etc. combines elasticity with hardness. Marketed by Storalindustrie, Grevenbroich, Germany. GN (4)

A Modified Impingement Corrosion Apparatus. H. W. Brownsdon & L. C. Bannister. *Institute of Metals, Advance Copy* No. 608, Sept. 1932, 8 pages.

The sample is immersed in the test solution and a jet of air blown on it at a given angle. The distance of the jet from the sample, the dimensions of the jet and the pressure of the gas must be carefully controlled. Under such conditions reasonable and reproducible results are obtained. A 500-hr. test is used. The depth and area of the resulting pit afford the best gage of corrosion. Preliminary results on several Cu-base alloys are given. JLG (4)

A Method for the Measurement of the Dissolution of Metals in Salt Solutions. L. Whitby. *Transactions of the Faraday Society,* Vol. 28, May 1932, pages 474-478.

The method is to analyze samples of gas periodically removed from above the corroding liquid and to determine the volumes of O_2 absorbed and of H_2 evolved. Mg when dissolving in very dilute NaCl solutions does not absorb appreciable quantities of O_2. By this method serious errors are not probable. PRK (4)

A Case of Severe Corrosion in the Upper Drum of a Water Tube Boiler. (Erhebliche Ausrostungen in der Obertrommel eines Schrägwasserrohrkessels.) *Zeitschrift des bayerischen Revisionsvereins.* Vol. 36, July 15, 1932, pages 159-160.

Considerable corrosion was observed in the water space of the boiler drum inspected. Rust grooves and pits up to 4 mm. deep were found, particularly near the plate joints. The remedies are described. GN (4)

Soil Survey Methods are Essential Part of Any Corrosion Survey. Scott Ewing. *Oil & Gas Journal,* Vol. 30, Apr. 21, 1932, pages 42-44.

A paper presented before the American Gas Association Distribution Conference. A comprehensive summary of methods of soil corrosion determination. A rough relation is shown between corrosiveness and resistivity for alkali soils and between acidity and corrosiveness for acid soils. Some soil series are uniform in their properties and corrosiveness while others are not. The corrosiveness of the soil cannot be determined with any precision by any one of these methods. All factors must be considered. VVK (4)

Controlled Data from an Immersion Test. R. F. Passano. *Preprint* No. 44, June 1932 meeting, *American Society for Testing Materials,* 7 pages.

In an immersion corrosion test, in a device not described, the author maintains the temperature, oxygen concentration, velocity, type of water, area of specimen, and surface condition of specimen constant varying only the time of test. By the use of modern statistical theory it was shown that, with these variables under control, the resulting data did not differ significantly and that the average loss of weight was apparently proportional to the logarithm of time over the interval investigated. 2 references. VVK (4)

The Topochemistry of Corrosion and Passivity. I. Attempt to Develop the theoretical Principles. (Zur Topochemie der Korrosion und Passivität. I. Versuch einer Darstellung der theoretischen Grundlagen.) Erich Pietsch & Edith Josephy. *Zeitschrift für Elektrochemie,* Vol. 37, Nov. 1931, pages 823-838.

The theories so far adduced to explain the corrosion phenomenon are reviewed and discussed and the shortcomings pointed out. For a new explanation it is assumed that corrosion consists primarily in an adsorption at the active discontinuities of the surface which would mean a heterogeneous catalysis. This is explained by the quantum-mechanical theory. Passivity and overvoltage can be explained on the same basis, and it is shown that the adsorption potential plays an important part in corrosion. Ha (4)

Method of Preventing Corrosion of Air Preheaters. (Verfahren zur Vermeidung der Korrosion in Taschenluftvorwärmern.) P. E. Quintes. *Die Wärme,* Vol. 55, Jan. 16, 1932, pages 45-46.

The temperature conditions prevailing in commercial air preheaters are analyzed and devices are suggested to prevent local supercooling of the waste gases below the dew point which results in a severe corrosion attack due to the presence of SO_2. EF (4)

Tests Made to Prolong Life of Paint on New Water Tanks. D. W. Johnson. *Water Works Engineering,* Vol. 85, Aug. 24, 1932, pages 1010-1012.

Experience has shown that unless care is exercised in choice of paint material and workmanship employed on the first paint job, the coating will fail within 2 years. Steel used in constructing a tank should be free from mill scale and rust and preferably should receive a priming coat at the mill. Should rust or scale be present, before fabricating the steel should be sand blasted or thoroughly brushed and scraped. CBJ (4)

The Anodic Treatment of Aluminum. E. Joyce. *Monthly Review, American Electroplaters' Society,* Vol. 19, Jan. 1932, pages 16-26.

Includes discussion. Paper before Philadelphia Branch Annual Meeting, Nov. 21, 1931. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 292. LCP (4)

Corrosion Tests of Light Metals. (Korrosionsprüfungen der Leichtmetalle.) *Schweizerische Technische Zeitschrift,* Vol. 29, Apr. 28, 1932, pages 260-263.

The corrosion tests of light metals and alloys which have been developed by the laboratories of the members of the European aluminum association in coöperation with the "Bureau International d'études et de propagande pour le dévelopement des emplois d' aluminium" are described. In corrosion testing the data accumulated have to take account of the composition and the pre-treatment of the alloy, the dimensions of the specimens and the corrosion apparatus, testing temperature and the suspension of the specimens. Among the abbreviated corrosion tests are described: (1) the HCl test according to Mylius, (2) the gas-volumetric test in HCl, (3) the oxidizing test in NaCl according to Mylius. Among the long time corrosion tests are described: (1) the oxidic tests in NaCl as developed by the Deutsche Versuchsanstalt für Luftfahrt. (2) solubility tests, (3) the salt spray test, (4) immersion tests, (5) alternating immersion tests. GN (4)

The Relative Corrodibilities of Ferrous and Non-Ferrous Metals and Alloys. Part III—Final Report. The Results of Three Years' Exposure at Southampton Docks. J. Newton Friend. *Journal Institute of Metals,* Vol. 48, 1932, pages 109-120; *Engineering,* Vol. 133, Mar. 11, 1932, pages 329-330.

Includes discussion. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 343. LFM (4)

Apparatus for Practical Testing of Corrosion of Metals (Apparecchi per prove pratiche di corrosione dei metalli.) M. Gambioli. *Rivista Aeronautica,* Vol. 7, Nov. 1931, pages 297-305.

Discussion of the causes of metallic corrosion. Comment on some of Guidi's papers. Report on different apparatus for testing the corrodibility of metals. Finally, a new wet-and dry apparatus is described. GG (4)

Anodically Oxidized Aluminum as a Novel Construction Material in Electro-Technique and Automobile Industry. (Anodisch oxydiertes Aluminium als neuer Werkstoff für die Elektrotechnik und den Automobilbau.) K. Altmannsberger. *Metallwaren Industrie und Galvano-Technik,* Vol. 29, May 15, 1931, pages 217-218.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 246. EF (4)

Corrosion of Earthing Conductors. C. W. Glanister. *Electrical Review,* Vol. 111, July 29, 1932, page 160.

After 12 mo. specimens of Cu stranded conductors used as earth connections and Cu plates buried in coke-breeze were inspected. Considerable corrosion was found to have taken place, all of it on the sections surrounded by the coke-breeze. In one case, the 0.075 in.^{2} conductor had corroded completely away. Cu sections which passed through clay were not affected. Opinion is that rapid corrosion was not caused entirely by local action but was probably assisted by earth leakage currents. Cu-C cell is formed by Cu buried in coke-breeze, causing Cu to go into solution. Coke contains NH_3 and NH_4 salts which facilitate corrosion of Cu. Addition of $CaCO_3$ to coke-breeze would protect Cu and prevent rapid corrosion. MS (4)

Corrosion in Highly Stressed Boilers. (Ueber Korrosionserscheinungen an Hochleistungskesseln.) E. Lupberger. *Elektrizitätswirtschaft,* Vol. 31, Mar. 15, 1932, pages 118-119.

See "Occurrences of Corrosion in High-Pressure Steam Boilers," *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 292. EF (4)

Errors in Construction of a Preheater. Cracking in Brass Tubes. (Baufehler an einem Vorwärmer. Rissbildung in Messingrohren.) BERTHOLD BLOCK. *Korrosion,* supplement to *Chemische Apparatur,* Vol. 19, Apr. 25, 1932, pages 13-14.

Several 60-40 brass tubes in a syrup preheater, utilizing the vapor from one effect of an evaporator as heating medium, sprung leaks after a few days of operation. The cracking of the tubes was caused by the combined action of ammonia vapor present in the steam and stresses imposed by poor construction of the supporting sheet. The latter made it necessary to bend the tubes and keep them in tension. Being 60-40 brass, cracking occurred when subjected to ammonia. Better construction and the use of 70-30 brass proved a satisfactory remedy. BER (4)

Studies on Stress-Corrosion Cracks in Light Metals. (Untersuchungen über Spannungs-Korrosionsrisse an Leichtmetallen.) P. BRENNER. *Zeitschrift für Metallkunde,* Vol. 24, July 1932, pages 145-151.

A study of the conditions leading to the formation of stress-corrosion cracks in light metals. A number of examples of such cracks is given and illustrated for Al-base and Mg-base alloys. Two Al-base alloys (I. 4.07% Cu, 0.51% Mg, 0.34% Si, 0.61% Mn, 0.39% Fe; II. 4.19% Cu, trace Mg, 1.02% Si, 0.61% Mn, 0.34% Fe) were studied; these alloys differed in the type of corrosion, the first (I) showing no intercrystallization attack and the second (II) pronounced intercrystallization attack. The alloys were given 3 kinds of deformation: elastic, plastic, and plastic plus elastic. The alloys in the deformed state were subjected to corrosive attack in a standard (DVL) salt-spray apparatus. Alloy I showed no tendency towards the formation of cracks under any of the conditions chosen; alloy II undeformed and plastically deformed also showed no such tendency, but when deformed elastically, and plastically plus elastically, formed cracks leading finally to fracture. The time to fracture is determined by the amount of elastic deformation (shown in a graph); the addition of plastic deformation to elastic facilitates the formation of cracks, though plastic deformation alone is ineffective. Stresses of the order of 4 kg./mm.^{2} are effective. It is concluded that crack-formation is a consequence of intercrystallization corrosion, which, however, will obtain only when elastic stresses are present. RFM (4)

Limits of Waste Heat Utilization with Respect to Corrosion of Equipment in Contact with Stack Gas. (Grenzen der Abwärmeverwertung in bezug auf die Korrosion rauchgasberührter Apparate.) WILHELM GUMZ. *Korrosion,* supplement to *Chemische Apparatur,* Vol. 19, Mar. 25, 1932, pages 9-11.

Combustion gases contain different amounts of water from various sources and consequently have various dewpoints. It is essential that the temperature of operation is not carried below the dew point if corrosion is to be avoided. Dangers other than H_2SO_4 corrosion arise when the fuel contains S since flue dust is likely to become hygroscopic and attract water. The construction of any interchanger is important from the viewpoint of gas cooling rate and the consequent rapidity of approach to the dewpoint. The ideal design would permit operation at a uniform wall temperature somewhat above the dewpoint of the waste gas; since this is impossible, a bend free counter current interchanger, using a high flue gas velocity, a low air velocity, and operating at a temperature well above the dewpoint is recommended as an approximate solution to the problem. BER (4)

Metallurgical Problems Arising from Internal Combustion Engine Valves. J. R. HANDFORD. *Iron & Steel Institute, Advance Copy* No. 4, Sept. 1932, 39 pages.

The requirements for valve steels as given by several engineers are listed and discussed. Many steels that have been used in valves are described, and the functions of the various alloying elements discussed. Scaling tests at 800° and 900° C. of 10 valve steels indicated that most of the steels have a satisfactory resistance to scaling. Specimens of steels of various analyses were held in an oxidizing atmosphere at elevated temperatures for 1000 hr. and their resistance to deterioration at such temperatures determined by microscopic examination and mechanical tests at both low and high temperatures. Due to the complexity of the steels investigated and the number of data obtained it is impossible to summarize the results of these tests here. The causes of valves cracking are discussed. Some experiments with Stelliting valves are described. Stellited valves when properly made and heat treated give excellent results. In general, the widely used valve steels are not attacked by exhaust gases other than those from fuels containing Pb tetra-ethyl. A study of the deterioration of austenitic steels is described. Some of these steels show changes in structure when heated to 600° C. and these changes appear to be similar to "weld decay" in 18-8 stainless steel. JLG (4)

Acidproof Alloys. (Säurebeständige Legierungen.) *Kali, Erz und Kohle,* Vol. 29, Sept. 10, 1932, pages 142-144.

Survey on the present status of ferrous and nonferrous alloys of high resistance against acids. GN (4)

Causes and Prevention of Corrosion in Gas Heated Water Heaters. (Korrosionserscheinungen im Wasserweg gasbeheizter Warmwasserbereiter — Ursachen und Abhilfe.) *Gas und Wasserfach,* Vol. 75, Sept. 17, 1932, pages 753-758.

Some typical cases of corrosion of gas heated water heaters are described, the results of an examination of 2 heaters are discussed. In the one case corrosion was found to be due to electric stray current. Means of corrosion protection are outlined. GN (4)

The Removal of Scale from Water Spaces. *Engineering,* Vol. 133, Apr. 22, 1932, pages 493-494.

Describes tests carried out by Messrs. Mirrlees, Bickerton & Day, Ltd., Stockport, England, in an attempt to find a rapid and safe method of cleaning out the water spaces of Diesel engines. A substance is used called "Mirrlees Inhibitor," a dry powder which when added to HCl reduces the action of the acid on the metal with very little effect on the scale. Graphs are given showing the effect of the addition of the inhibitor and of varying the strength of the acid. When the container used is of brass, bronze, gunmetal, Cu or Sn no inhibitor is needed. If steel or cast Fe is used, the inhibitor should be used to reduce the action of the acid on the metal. LFM (4)

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The Behavior of Pure Aluminum towards Acids and Bases. (Verhalten von reinsten Aluminium gegen Säuren und Basen.) M. CENTNERSWER. *Zeitschrift für Elektrochemie,* Vol. 37, Aug.-Sept. 1931, pages 598-603.

Al of 99.95% purity dissolves very slowly in HNO_3 and H_2SO_4. In HCl a measurable rate of solution is obtained only in solutions more concentrated than 2 *N* at 25°. The rate of solution depends on concentration according to the formula $dv/dt = K_nC^n$. The temperature coefficient between 25° and 35° C. is 7.0. In alkalies, pure Al dissolves in the same manner and with the same speed as 99% Al. Pure Al dissolves in dilute NH_4OH. Ha (4)

Chemical Stability of Some Non-ferrous Alloys. (Die chemische Beständigkeit einiger Nichteisenmetall-Legierungen.) W. CLAUS. *Die Metallbörse,* Vol. 22, Jan. 23, 1932, pages 97-98; Feb. 1, 1932, pages 129-130.

The chemical stability of some metallic substances was measured by the loss in weight in mg./m.²/day with reference to the metallic surface attacked. Data are given for 2 Cu-Sn alloys (93.75 Cu, 6.05 Sn and 90.21 Cu, 9.79 Sn respectively) 1 Cu-Sn-Zn alloy with 88.68 Cu, 6.90 Sn, 4.42 Zn and 1 Cu-Sn-Pb alloy containing 83.92 Cu, 9.58 Sn, 5.94 Pb. The test pieces were cut from ingots and investigated in the as-cast and annealed state. The samples were tested in a specially designed apparatus in which the solution is agitated. The testing time varied between a couple of hours and a period of several weeks. The testing solutions comprised 3% NH_3, 5% HCl, 3% KOH, natural sea-water, and 2 and 4% Na_2SO_4 solutions. In general the alloys were attacked severely after 8 hours in NH_4OH and HCl, but proved to be stable in the other solutions applied. A protective layer at the surface of the specimens was noticed in KOH which finally stopped the corrosion attack entirely. The presence of air increased the activity of the NH_4OH and HCl solutions. No differences between the cast and heat-treated samples were found. EF (4)

Corrosion of Water Heaters. [Beitrag zur Frage der Rostungserscheinungen in Warmwasserbereitern (Boilern).] KARL DAEVES & RUDOLF GROSSSCHUPFF. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Sept. 4, 1932, pages 465-466.

The causes of such corrosion are first discussed. Statistical research proves that material, stray currents and H_2O analysis (with exception of gas content) are of minor importance. Corrosion in water heaters is primarily caused by the construction. Low pressure heaters installed at the Vereinigte Stahlwerke showed hardly any tendency to corrosion, high pressure boilers were completely destroyed after 3 years of service. The high pressure heaters were fed direct from the municipal water line, whereas an intermediate tank was used on the low pressure heaters which obtained the water preheated. GN (4)

Corrosion and Construction in the Literature. (Korrosion und Konstruktion im Schrifttum.) WALTER DEUTSCH. *Korrosion und Metallschutz,* Vol. 8, Aug. 1932, pages 205-210.

Choice of materials should go hand in hand with correct construction. Proper use of building and structural materials is emphasized by references to relevant articles in the literature. 65 references. BER (4)

The Behavior of Metals against Salts, in particular against Ammonium Salts in the Presence and Absence of Ammonia. (Ueber das Verhalten von Metallen gegenüber Salzen, insbesondere gegenüber Ammonsalzen in Gegenwart und ohne Gegenwart von Ammoniak.) HILDEGARD EHRIG. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, July 1932, pages 385-397.

The metals Cu, Bi, Pb, Ni, Co, Fe, Cd, Zn and Mg were investigated to find the causes leading to a dissolution of the metal after an electrolytic deposition of the metal from an ammoniacal solution and to obtain some insight into the mechanism of corrosion. Cd, Zn and Mn were strongly dissolved, Cu to a lesser degree. The various chemical reactions taking place between metal and solution and the importance of NH_3 is discussed in detail. Ha (4)

Corrosion of Binary Alloys of Magnesium. H. ENDO AND S. MORIOKA. *Kinzoku no Kenkyu,* Japan, Aug. 1932, pages 328-366.

Binary alloys of Mg containing 1 to 8 % Sn, Bi, Tl, Cd, Pb, Zn, Sb, Al, Ca and Ni were immersed in distilled water, 1/10 *N* NaCl solution and sea-water and the weight loss of each specimen was measured after an exposure of 30 days. Alloys containing 8 % Al and 5 to 8 % Ni proved to have strong resistivity to corrosion in distilled water. Alloys containing other elements showed weak resistivities. In 1/10 *N* NaCl solution and in sea water, alloys containing Cd, Zn and Sn showed good results irrespective of their contents, and the alloy containing Pb showed best results when its content is 2 to 3 %. Other elements proved to have no marked resistivity. Al and Ni showed no resistivity in this case. The most interesting fact in the above results is that: Cd and Zn which belong to the same group as Mg in the periodic table and have the same space lattice as magnesium showed the best resistivity to corrosion. Ca and Al which have very similar chemical properties but different space lattices showed no good results. Corrosion tests were also carried out by means of salt spray and intermittent immersion tests. The results were almost the same as in the immersion test described above. KT (4)

Surface Protection of Light Metals. (Oberflächenschutz von Leichtmetallen.) J. FEISER. *Die Umschau in Wissenschaft und Technik,* Vol. 36, May 28, 1932, page 428.

After mentioning paint coatings, galvanic coatings, mechanical plating, anodic oxidation is discussed and attention is directed to the Eloxal method of the Vereinigte Aluminium Werke. The bath consists of oxalic and chromic acid. A film of 0.02-0.03 mm. thickness is secured, the properties of which can be varied between a hard brittle oxide, almost as hard as corundum, or a less hard and elastic oxide. Stress is laid on the fact that the Eloxal layer is a perfect insulation. The chemical resistance can be improved by impregnating the film with paint coatings which may be any color. Al-pistons impregnated with fat did not display any noticeable sign of wear. Eloxal films show a greater resistance to wear than Cr plated surfaces. EF (4)

Cathodic Protection of Metals in Neutral Solutions. U. R. EVANS. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 62-64.

The author describes experiments on the protective value of cathodic current density and gives the results of a number of measurements. The variation between specimens of the same material was found to be greater than that between different salt solutions. The effectiveness of cracked Zn and Al coating in protecting Fe against various corrosive conditions is discussed. 7 references. WLC (4)

Corrosion When Oxygen is Present and Absent. Reply to E. Liebreich. (Korrosion unter und ohne Mitwirkung von Sauerstoff. Erwiderung an E. Liebreich.) U. R. EVANS & C. W. BORGMANN. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 160, June 1932, pages 194-204.

Corrosion tests on samples of Fe (0.03 C, 0.021 Mn, 0.017 Si, 0.18 S and 0.006 P) and of steel (0.34 C, 0.64 Mn, 0.2 Si, 0.025 S and 0.027 P) vertically placed in a 0.1 *N* KCl solution, proved that the intensity and distribution of the corrosion attack is entirely different according to whether $N_2 + H_2$, or air + O_2 are present above the water line. It is shown by means of horizontal samples that the corrosion caused by a drop of 0.1 *N* KCl solution is the same, irrespective of the surrounding air being unsaturated, saturated or over-saturated with water vapor. These observations are not in agreement with the experimental tests of E. Liebreich, on which the latter bases his criticism of the corrosion theory with particular regard to the differential aeration effect. EF (4)

The Formation of Sulphide Layers on Silver and Silver Alloys. (Ueber die Bildung von Sulfidschichten auf Silber und Silberlegierungen.) KURT FISCHBECK. *Zeitschrift für Elektrochemie,* Vol. 37, Aug.-Sept. 1931, pages 593-598.

An optical method was used for following the formation of the sulphide layer on Ag, Cu, Ag-Cu and Ag-Cd alloys, wherein light reflected from the coated metal plate is compared by means of the Pulfrich step photometer with that from a clean plate. The increase of coating thickness with time was found to follow Fick's diffusion law. Cd in small quantities has little effect in slowing down the formation of sulphide on Ag-Cd alloys; above 30% Cd the action of S is very slight. Cu is not affected by the presence of Ag in quantities less than the amount necessary to form the eutectic. The presence of small quantities of Cu in Ag alloys increases the coating formation, indicating that the permeability of a Ag_2S layer containing Cu_2S is greater than that of Ag_2S alone. Ha (4)

The Rusting Process under Differential Aeration. (Über den Rostvorgang bei ungleichmässiger Belüftung.) G. SCHIKORR. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 160, June 1932, pages 205-210.

Some of Liebreich's observations are seemingly in disagreement with Evans' corrosion theory of differential aeration. Experiments are carried out which proved that the Evans theory is still valid under testing conditions as described by Liebreich. The experimental results are summarized as follows: An Fe surface in a highly polished state is at least barely attacked by normal NaCl solutions when air is excluded. Even if evaporation is prevented and the air admitted, an Fe spot covered by a drop of NaCl solution is particularly heavily corroded in the interior regions of the boundary region Fe/solution. In a short circuited cell pure Fe/2 *N* KCl solution/2 *N* HCl solution/pure Fe. The Fe in the KCl solution, goes preferably into solution, if the total resistance is sufficiently low. The corrosion phenomena observed on Fe under irregular oxygen distribution, are interpreted by the Evans theory to a far-going extent. EF (4)

The Chemical Reactions of the Corrosion of Metals. (Über die chemischen Reaktionen bei der Korrosion der Metalle.) G. SCHIKORR. *Paper Second Corrosion Congress Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Deutsche Gesellschaft für Metallkunde and Verein deutscher Chemiker,* Oct. 17, 1932, Berlin. Mimeographed report, pages 1-2.

The velocity of corrosion depends essentially on the chemical reactions and the products of corrosion. The actual reactions of corrosion are oxidation and reduction. In particular the process of oxidation in metal corrosion is the transition metal → metal ion. The primary occurrence may also be halogenous ion → halogen. In the corresponding reduction process the electrons set free at oxidation are absorbed by O molecules, H or metal ions which in turn are transformed to hydroxyl ions, gaseous H and metal respectively. Besides these electro-chemical reactions there may still occur in the solution purely chemical reactions which also have a large bearing on the further course of corrosion. Thus, a large number of reactions frequently affect a certain type of corrosion. In determining the velocity of corrosion it is of importance to know which reaction proceeds the slowest, since this one frequently characterizes the whole process. The influence of the products of corrosion on the process was considered at length. The corrosion of metals by gases in the absence of water can be subjected to other laws than while H_2O is present so that conclusions from one type of corrosion to another are to be drawn cautiously. However, it is to be emphasized that also in the presence of H_2O occurrences of considerable variety can be decisive so that conclusions from the behavior of a metal under certain conditions can be drawn on the behavior under other conditions only when the factors of corrosion are comparable in both cases. GN (4)

Solution of Aluminum in Alkaline Solutions. (Die Auflösung von Aluminium in alkalischen Lösungen.) G. SCHIKORR. *Zeitschrift für Elektrochemie,* Vol. 37, Aug.-Sept. 1931, pages 610-613.

The rate of solution of Al strips was determined by the rate of generation of H_2. There is an induction period, followed by a rise in rate to a maximum, a fall later to zero (for solutions under 0.95 *N*) and a rise to a second, lower, maximum. The inactive period is lengthened by Na_2SiO_3. Similar results were obtained with KOH, $Ba(OH)_2$ and NaOH plus NaCl. The rate of solution was independent of the purity of the Al, the dimensions of the test piece and the H_2 overvoltage. Ha (4)

On the Oxidation of some Gray Cast Iron. U. HASHIMOTO. *Kinzoku no Kenkyu*, Japan, Vol. 9, May 1932, pages 218-224.

Cast irons used for many years unbroken were compared with those damaged in a short time. 3 different cases of the oxidation of ordinary gray cast Fe were microscopically investigated, i.e. (1) 2 cast Fe bars and plates of fire grating oxidized by the coal fire, (2) the cast Fe valve for the exhaust gas of a coal gas producer exposed to gas of 400° C. and (3) the cast Fe cover of a heating box injured by the heating medium. In all cases it was observed that the cast irons with more Si, P and S, with less Mn and with large lamellae of graphite were oxidized to a greater degree than those of opposite compositions. Slag inclusions seemed to be unfavorable to heat resistivity. KT (4)

Progress in Steel Metallurgy as Regards Resistance to Corrosion. W. H. HATFIELD. *Journal West Scotland Iron & Steel Institute*, Vol. 39, Part V, Feb. Session 1931-2, pages 77-92. It is believed that ordinary Fe or steel develops a protective film when exposed to the atmosphere, but that this film is not sufficiently resistant to corrosion. The author is of the opinion that the phenomenon of passivity is not always sufficiently studied by the technologist, and that laws of physical chemistry should be applied in studying corrosion resistance of steels. The first common resistant steel was the 14% Cr, 0.30% C steel used for cutlery. The required hardness of this steel is obtained by hardening from 950°-1000° C. and tempering at 180°-200° C. The next advance in the development of corrosion resistant steel was the 18:8 type. A new type of austenitic Cr-Ni steel, developed especially for use when extreme ductility for pressing work is required, contains 12% Cr and 12% Ni. This steel, after quenching from 1050° C. is considerably softer and more ductile than the 18:8, possessing a considerably reduced cold-work hardening property. The welding and machining properties are also discussed. One point of interest is that intercrystalline corrosion is reduced by lowering the C content to 0.07% or by the addition of 0.7% W especially if the softening temperature was kept at 950° C. GTM (4)

Accelerated Tests Reveal Erosion-Resisting Metals. T. F. HENGSTENBERG. *Power*, Vol. 76, Sept. 1932, pages 118-120. Specimens of various metals whirled past a water jet at speeds up to 1200 ft./sec. show test results that agree closely with their actual erosion as machine parts in commercial service. In general, the harder materials offered the greatest resistance to erosion. AHE (4)

Time-potential Curves on Iron and Steel and their Significance. T. P. HOAR & U. R. EVANS. *Iron & Steel Institute, Advance Copy* No. 6, Sept. 1932, 12 pages. A new method for determining time-potential curves is described. A frayed filter paper saturated with electrolyte is in contact with the surface to be tested. The curves obtained give information regarding the behavior of the oxide films. Curves for various steels and various solutions are shown. Curves for Fe and steel show at first rapidly falling potentials in chloride and sulphate solutions. The tendency to break down is greater for rough surfaces than for smooth surfaces. Liquids containing chromate show a tendency to repair the film if enough chromate is present. Alloys containing Cr tested in chloride solutions give rising, level, or falling potentials depending on conditions. 15 references. JLG (4)

Corrosion Prevention by the Atrament Process. (Rostschutz durch Atramentverfahren.) A. KARSTEN. *Korrosion*, supplement to *Chemische Apparatur*, Vol. 19, Jan. 25, 1932, page 1.

The atrament process consists of producing a surface film on Fe by immersion in a solution of phosphate salts of a definite composition. The film is said to be resistant to aqueous and atmospheric corrosion and other types of attacks. The film forms a good base for paints. See also "The Atrament-Process," *Metals & Alloys*, Vol. 2, Dec. 1931, page 299. BER (4)

Surface Protection of Light Metals. (Oberflächenschutz der Leichtmetalle.) TH. LEIB & FR. KOLKE. *Farben Zeitung*, Vol. 36, June 11, 1931, page 1266.

See *Metals & Alloys*, Vol. 2, Sept. 1931, page 165. EF (4)

Experience on Low Pressure Turbine Blades in the Klingenberg Power Station. (Erfahrungen mit Niederdruckturbinen-Beschauflung im Kraftwerk Klingenberg.) FR. GROPP & W. ELLRICH. *Elektrizitätswirtschaft*, Vol. 30, Oct. 1931, pages 589-593.

Practical experience on turbine blades was gained in the German Power Plant Kingenberg on the following materials: (1) V5M steel with 14.0 Cr, 0.6 Ni, 0.15 C, 0.7 Si, 0.5 Mn, 0.02 P+S, 84.01 Fe; (2) 5% Ni-steel with 0.14 Cr, 0.31 Si, 0.32 Mn, 0.014 P, 0.002 S, 94.19 Fe; (3) WF100 with 18.6 Ni, 9.64 Cr, 0.57 C, 1.63 Si, 0.82 Mn, 0.01 P, 0.003 S, 68.72 Fe; (4) Monel metal with 67 Ni, 28 Cu, 5 Fe, Si+Mn; (5) Nickel brass containing 50 Cu, 40 Zn, 10 Ni; (6) Mn-steel with 13% Mn. Steels (1) - (3) exhibited erosions beginning at the fourteenth low pressure stage and gradually increasing in depth toward the 24th stage. The observations were made after 10,000-15,000 service hours. The erosions occur immediately after entering the wet steam range and not at a moisture of 6-7% as is generally assumed. In order to prevent these erosion effects, the edge of the 5% Ni-steel blades was provided with lashings. The material used for the reinforcement was Monel metal. The experiment was not successful, since erosions showed up after 844 hours in service. A second test was run, in which Ni-brass (5) reinforcements were employed which however also failed in service. The difficulties were entirely overcome when lashings of 13% Mn steel were applied on V5M steel (1) blades and on some turbine blades of steel WF100 (3). No erosions were noticed after thousands of service hours. The paper includes tables which give the physical properties at ordinary temperatures of the material listed under (1) - (5). Some diagrams show the distribution of the erosion on the turbine blade and a set of curves reveals the state of erosion in relation to the time in operation. It is noteworthy that the initial heavy corrosion gradually decreases after the blades are in operation for say 3000-5000 hours. The maximum critical depth of erosion is computed to be 10 mm. One diagram shows the stress of a turbine blade in the 24th low pressure stage in relation to the erosion. EF (4)

Field Tests of Metallic Coatings. F. A. HULL, *et al. Proceedings American Society for Testing Materials, Preprint* 12, 1931, pages 11-40.

Report of subcommittee 8 of Committee A-5. Extensive tabulated data are given on the progress of corrosion of the galvanized sheet specimens and of the hardware, structural shapes, conduits, etc., which were provided with a variety of protective coatings and exposed in various locations. Ha (4)

Use of Arc-Welded Alloys to Arrest Corrosion of Ordinary Small Refinery Equipment. RAYMOND S. HOFFMAN. *Oil & Gas Journal*, Vol. 31, Sept. 1, 1932, page 10.

A method is illustrated of protecting against corrosion the C steel fittings of pipe-line joints in cracking equipment. A protective covering of non-corrodible alloy, for instance KA2 or NCT 3, is welded on by arc welding. A flux-coated electrode of the alloy is employed with 20-22 volts across the arc and current of 150 amperes from portable d.c. generators. A saving of $21,871 was effected by the use of arc-welded alloy-lined fittings for a high-pressure cracking plant. (4)

Corrosion on Fire Fighting Vessels and Its Prevention. (Korrosionserscheinungen an Feuerwehrfahrzeugen und die Massnahmen zu deren Bekämpfung.) F. REINCKE. *Korrosion und Metallschutz*, Vol. 8, July 1932, pages 169-172; *Farben Zeitung*, Vol. 37, May 14, 1932, pages 1058-1059.

Paper before the Verein Deutscher Ingenieure and Verein Deutscher Chemiker, Berlin, Dec. 1931, refers to failure in service after 6 months due to corrosion of steel boiler tubes in fire fighting engines. Investigations showed that the source of trouble was neither defective material nor the composition of the boiler water. The presence of electrochemical influences was soon proved by Zn-linings which were rapidly dissolved but checked the corrosion effect. New fire fighting vessels also exhibited severe corrosion after relatively short service periods. A coating of black varnish after the removal of rust was not effective. Water analyses taken at the fire fighting station did not yield any clue. The presence of electrolytic currents between the bronze screw and the Fe ship hull was counteracted by a metallic Zn spray coating on the sand blasted hull. The most endangered parts were furthermore provided with 5 mm. Zn plates. The latter disintegrated after half a year and were replaced. Corrosion still occurred. Then the electric lead wires were freshly insulated and the single terminals were removed, the corroded parts were repaired by welding, the bronze propeller was replaced by a steel screw and 6 mm. Zn plates were welded on the hull. This finally checked the corrosion attack which was greatest at parts exposed to the most intensive currents and was promoted by the combined action of air and water. Zn plates should not be screwed or riveted on but welded. The ground coat must be applied immediately after cleaning and drying of the surface, i.e. before Fe oxide hydrate develops. EF (4)

Effect of pH on the Corrosion Products and Corrosion Rate of Zinc in Oxygenated Aqueous Solutions. B. E. ROETHELI, G. L. COX & W. B. LITTREAL. *Metals & Alloys*, Vol. 3, Mar. 1932, pages 73-76.

The authors discuss the action of the products of corrosion in protecting the body of metal from further corrosion. The possibility of destruction of the film by solutions of varying pH is discussed. The amphoteric character of Zn hydroxide suggested that a study of the corrosion of Zn in aerated salt solutions of varying pH might show results of interest. The apparatus for conducting such experiments is described. The curve of corrosion rate vs. pH shows a very low rate of corrosion between pH of 6 and 12.5. This is attributed to the formation of dense adherent corrosion product films. The high corrosion above and below these values of pH is attributed to high solubility of corrosion products and ease with which H and hydroxyl ions and O reach the metal surface. Variations in the turbulence of the solution and other external factors may affect the limits of the formation of a stable film or may result in pH gradients from points immediately adjacent to the specimen and the main body of the solution. 41 references. WLC (4)

Note on article "Corrosion Resistance of Cu, Sn-bronzes and Sn towards Inorganic Acids. (Zuschrift/Zur Kenntnis der Widerstandsfähigkeit von Kupfer, Zinnbronzen und Zinn gegen anorganische Säuren.) W. ROHN. *Zeitschrift für Metallkunde*, Vol. 24, July 1932, page 153.

It is claimed that the classification used by Claus and Finke in their article on the above subject is not to be recommended. RFM (4)

Corrosion Stability — Including Galvanic Influences — of Metallic Structural Material in Brewery Industry. (Die Korrosionsbeständigkeit—einschliesslich galvanischer Einwirkungen—der metallischen Werkstoffe in der Brauindustrie.) P. SCHAFMEISTER & W. TOFAUTE. *Zeitschrift für das gesamte Brauwesen*, Vol. 55, Jan. 1932, pages 1-7; Jan. 1932, pages 9-11.

Comparative laboratory tests including Al, Cu, Fe, tin plated Fe and V2A steel showed that V2A is by far most superior in regard to losses in weight and in galvanic corrosion in both water and beer. Intercrystalline corrosion in welded joints is overcome by the application of special alloys V2A-H and V2A Extra. EF (4)

Wear of Wrought Iron vs. Steel Pipe. STANLEY P. WATKINS. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 51, 56.

The author reports the superior resistance of wrought Fe over steel in the discharge pipe of river dredge where the discharge consists of 70% sand and 30% gravel. WLC (4)

The Cause of Corrosion of Automobile Parts by Lubricants. (Die Ursache der Korrosion von Kraftfahrzeugteilen durch Schmiermittel.) WAWRZINIOK. *Automobiltechnische Zeitschrift*, Vol. 35, Sept. 10, 1932, pages 428-430.

Tests have shown that in spite of the very low acid content (less than permissible) of lubricants some oils can form local elements and act as electrolytes so that strongly corrosive effects take place. This can often be enhanced by defects in the electric installation of a vehicle on account of stray currents. Oils should be as free of acid as possible and have a high electric resistance. Ha (4)

STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Structural Metallography. H. B. PULSIFER. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 84-88. The author discusses methods of surface preparation and etching. The use of various reagents for etching is discussed and illustrated by a number of micrographs. The author shows evidence of a finer structure within the usual grain structure of metals which can be developed with more active reagents. The relation of this structure to cold working characteristics is cited as a fertile field for study. The shape of grains, most frequently square or hexagonal, is discussed in the light of surface tension and close packing of the grains. WLC (5a)

The Dia- and Paramagnetism in Series of Metallic Solid Solutions. (Zum dia- und Paramagnetismus in metallischen Mischkristallreihen.) ECKHART VOGT. *Annalen der Physik,* Series 5, Vol. 14, July 1932, pages 1-39. The general character of the metallic state is expressed by the uniform electric behavior of different substances, while the special characteristics of the lattice structure determine the magnetic behavior. The latter was exhaustively investigated in several series of solid solutions of alloys of Au-Ag, Au-Pd and Pt-Pd at high and low temperatures. The magnetic behavior of alloys can be represented by a quantity called "atomic susceptibility" which is brought in relation with the rule of mixtures and the deviations from which are determined for the various solid solutions. Ha (5a)

The Equilibrium Conditions in the System Fe-C-O. (Ueber die Gleichgewichte im System Fe-C-O.) ERNST JAENICKE. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 204, Feb. 24, 1932, pages 257-290. Taking into account all recent investigations on this subject the author modifies and revises his previously developed equilibrium diagram in such a manner that it becomes quantitatively correct as well as diagrammatically. The equilibria at different temperatures and pressures are calculated and graphically represented in a diagram which permits a distinction between the metastable and stable equilibria. Formulas for the relation of pressure and temperature are developed and the heat of formation of cementite is calculated. Contrary to current views, it is shown that a pressure maximum exists in the stable range at about 820° C. for the equilibrium of the 3 solid phases Fe, austenite, and FeO. A 3 dimensional diagram shows clearly the relations of composition of the gas, temperature and pressure to the constituent substances. 20 references. Ha (5a)

A Further Contribution on the Constitution of the Fe-C-Si System. A. KRÍŽ & F. POBORIL. *Iron & Steel Institute, Advance Copy* No. 7, Sept. 1932, 27 pages. Alloys containing a variable C content and 10 and 16% Si were studied by thermal and microscopic methods. Using the results of this study and data previously reported on alloys of lower Si content, constant-Si sections of the ternary diagram were constructed. Without an unwarranted amount of extrapolation, both the metastable and stable diagrams for the corner containing up to 16% Si and 4.5% C were constructed. A carbide, probably Fe_3C dissolving Si, occurs in the former system, which is replaced by graphite in the stable system. Projections of monovariant lines on the composition plane and isothermal sections are developed. A 4-phase plane at 1155° C. in the metastable system has the corners: α at 10.2% Si and 0.26% C, γ at 8.2% Si and 0.54% C, liquid at 6.9% Si and 2.61% C, and carbide at an undetermined composition. In the stable system the corresponding plane is at 1165° C. and has the corners: α' at 9.7% Si and 0.22% C, γ' at 7.7% Si and 0.52% C, liquid at 6.4% Si and 2.54% C, and graphite at 100% C. These planes are quadrangles and therefore do not represent eutectic reactions. 4 references. JLG (5a)

The Applicability of the Ideal Mass Action Law to Metallurgical Processes. (Anwendbarkeit des Idealen Massenwirkungsgesetzes auf metallurgischen Prozesse.) F. KÖRBER. *Die Naturwissenschaften,* Vol. 20, May 27, 1932, pages 409-412. The ideal mass reaction law, the Nernst Distribution Law (*Zeitschrift für anorganische und allgemeine Chemie,* Vol. 145, 1925, page 240) and the general mass reaction law according to Lorenz and van Laar are anticipated. The latter contribution to physico-chemistry had been checked on heterogeneous Pb-Sn melts under chloride slags between 500° and 600° C. The theoretical equilibrium isotherm of the Mn-reaction between steel and slag is not in accordance with the actual observations of practical steel making. Recent tests in the Kaiser Wilhelm Institut für Eisenforschung on the relationship between Mn-bearing Fe and slags consisting of MnO + FeO showed that the ideal mass reaction law can be considered as the fundamental equilibrium relationship. The concentration of Mn in the melt varied between 0 and 4% while MnO in the slag phase increased to above 70%. The temperature dependence of the equilibrium has been confirmed and corresponds to the reaction heats computed from formation heat of the oxides. Based on experimental observations, the writer ascribes the divergencies of Lorenz' data from the ideal mass reaction law to the fact that equilibrium conditions are attained in a surprisingly short time, so that only exceedingly rapid quenching preserves the equilibrium at a certain testing temperature. Owing to this, the experiments of Lorenz on the system Pb-Sn-$PbCl_2$-$SnCl_2$ were re-examined with the precautions mentioned above. The experiments proved that the reactions follow the true mass reaction law between 500° and 800° C. No indication of a break at the side of the nobler metal was noticed. Furthermore the equilibrium $Cd + PbCl_2 \rightleftarrows CdCl_2 + Pb$ was redetermined and found to follow the ideal isotherm to a more pronounced degree as previously determined by Lorenz and co-workers. The author concludes that in studying the steel making processes on thermo-dynamic grounds, the general mass reaction law offers a reliable guidance through the great variety of metallurgical reactions. However the difficulties involved in introducing the correct molar concentration into the calculation are not eliminated. EF (5a)

The Copper-rich Alloys of the Copper-nickel-tin system. JOHN T. EASH & CLAIR UPTHEGROVE. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 29 pages. Some questionable parts of the Cu-Sn system were studied, and a corrected diagram drawn. Cu-rich alloys of the Cu-Sn-Ni system containing 2, 3, 5, 10 and 20% Ni were studied by thermal, X-ray and microscopic methods. The Cu corner of the ternary diagram was constructed. The addition of Ni to Cu-Sn alloys causes the α field to contract, the contraction being greater at room temperature than at higher temperatures. The α plus γ field likewise diminishes as the temperature is lowered. 29 references. JLG (5a)

The Intermediate Phases of the Iron-tungsten System. W. P. SYKES & KENT R. VAN HORN. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 15 pages. Metallographic and X-ray studies proved that a phase corresponding to the formula Fe_2W was formed by reaction between the Fe-rich solid solution and Fe_3W_2 at 1040° C. This phase had been previously detected by Arnfelt, but had not been found by later workers. The eutectic was found to occur at 49% W. No evidence for the X-phase presumed by Takeda was found. 8 references. JLG (5a)

The Structure of White Bearing Metals. (Das Gefüge der weissen Lagermetalle.) THEWS. *Die Metallbörse,* Vol. 22, May 14, 1932, page 610. The contradictory properties expected of bearing metals are secured by hard crystals embedded in a soft matrix or by a hard matrix containing a soft net-like structure. The segregation tendency of the hard Sb-Sn crystals in Sn rich white bearing metals is counteracted by an addition of Cu. The lower the casting temperature and the faster the cooling, the smaller and more numerous the hard constituents. The bearing properties are reduced by the area decrease of the hard crystals. If the latter are in touch with each other, the plasticity and tenacity of the bearing is decidedly impaired. With regard to the Pb-bearing metals, the compressive strength increases with rising Sb contents up to the eutectic composition (87% Pb, 13% Sb). Further increase of the Sb content induces brittleness. In Pb-Sb-Sn alloys, Sn reduces the hardness and compressive strength of the matrix. In the soft Pb-Cu-Sb alloys, the hard constituent consists of violet, needle-shaped Sb-Cu crystals; the balance of Sb + Cu goes into the matrix and improves its physical properties. An analogous structure prevails in special Pb bearing metals which comprise alkali and earth alkaline metals. The hard primary Pb_3Cu and Pb_3Ba crystals are embedded in a soft eutectic matrix which also contains Ca, Ba, etc., in solid solution. EF (5a)

A Study of Segregate Structures in Copper-tin and Silver-zinc Alloys. D. W. SMITH. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 14 pages. The form and orientation of the α precipitate in the β matrix of Cu-Sn and Ag-Zn alloys were studied by microscopic and X-ray methods. The α phase in segregating from the β phase in Cu-Sn alloys takes the form of needles parallel to a [111] direction in the β phase. From observations of the twinning planes of the α segregate, the α phase was found to be orientated with respect to the β phase so that a (111) plane in the α phase was parallel to a (110) phase of the β matrix. The direction of the α needles in Ag-Zn alloys was the same as in the Cu-Sn alloys. The orientation of the α lattice could not be determined. The significance of the results are discussed, and analogies pointed out. 8 references. JLG (5a)

Protection of Microspecimens. Correspondence from ENRIQUE TOUCEDA. *Metals & Alloys,* Vol. 2, Feb. 1931, page 51. The writer suggests the use of cellophane tubes used for cigar wrapper as effective and convenient means of protecting the surface of specimens prepared for microexamination. WLC (5a)

The Alloys of Iron, Vanadium and Carbon. *Metallurgist,* June 1931, pages 91-94; July 1931, pages 98-100. An extended abstract of the work of R. Vogel & E. Martin and of H. Hougardy, *Archiv für Eisenhüttenwesen,* Vol. 4, Apr. 1931, pages 487-495 and 497-503. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 301 and Vol. 3, Feb. 1932, page MA 34. VVK (5a)

Recent Developments in the Study of the Constitution of Alloys (Die neuere Entwicklung der Konstitutionsforschung der Legierungen). W. GULRTLER. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 469-483. References to, and brief statements of the new features of, recent work on binary alloys of Fe with Ni, Co, Mn, Si, Cu, Zn, C, W, Mo, Cr, V, N, P, B, Bi, As, Sb; of Cu with Zn, Sn, Si, Mg, Be, Pb, Mn, Au, Ag, Pd, Pt; of Co with Ni, Cr, Cu; of Cr with Ni, N; of W with C, Re; of Mo with C; of Pb with Zn, Sn, Sb; of Sb with Zn, Tl; of Cd with Zn, Hg; of Al with Cu, Fe, Si, Mg, Be, Mn; of Mg with Zn, Cd; of Be with Ni, Si, Co, Fe; of Ag with Pt, Zn, Cd, Al; of Au with Pt, Ni, Zn and Cd. Useful as a finding list. HWG (5a)

Progress of Metallography. J. L. HAUGHTON. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 457-468. Methods of determining equilibrium diagrams are described in general terms, with a few details on dilatometric methods. 21 references. HWG (5a)

Photomicrography. A. MACDOUGALL. *Journal West of Scotland Iron & Steel Institute,* Vol. 39, Part II, Session 1931-32, Nov. 1931, pages 13-28; *Heat Treating and Forging,* Vol. 18, June 1932, pages 357-359, 366. It is pointed out that it is exceptionally difficult to truly represent the structure of a metal in a permanent form. Careful manipulation helps greatly in the production of a record which may be as near as possible a true representation of the structure. The technique of photomicrography is discussed and illustrated with high magnification. It was found that illumination by a plane glass is in the order of 22-23% of the total light. In the case of the prism the illumination is about 78%, and therefore the exposure could be decreased. MS + GTM (5a)

A Metallographic Investigation of Native Silver. H. C. H. CARPENTER & M. S. FISHER. *Bulletin Institution of Mining & Metallurgy,* No. 335, Aug. 1932, pages 9-17; No. 336, Sept. 1932, pages 3-4. Discussion. See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 264. AHE (5a)

Austenite-pearlite Transformation and the Transition Constituents. ALBERT SAUVEUR. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 247-254. Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 161. (5a)

The Influence of the Life Story of the Alloys on their Properties. (L'Influence de l'Histoire de la Vie des Alliages sur leurs Qualites.) A. MITINSKI. *Revue Universelle des Mines,* Series 8, Vol. 8, Sept. 15, 1932, pages 181-182.

A general discussion of the equilibrium diagram of cast Fe; it is pointed out what influence space and time of fusing in the blast furnace exert and how the eutectic points are changed by the addition of other ingredients besides Fe and C. The change of quality of a cast Fe by addition of several components is not the sum of the qualities of the individual components. Ha (5a)

Metallographic Investigation of Chromium-Molybdenum Steel During Different Stages of its Manufacture. K. F. STARODUBOV & F. M. GORBACHEVA. *Domez,* No. 3, 1932, pages 44-46; No. 4-5, 1932, pages 47-54. (In Russian.) Detailed description is given of the furnace practice and the properties of ingots made of open hearth Cr-Mo steel cast in straight wall big end down ingot molds. Macroetching, microexamination and physical testing were used. Nothing unusual was found. (5a)

The System Calcium Oxide-Phosphorus Pentoxide. (Beiträge zur Kenntnis des Systems Kalziumoxyd-Phosphorpentoxyd.) GERHARD TRÖMEL, with microscopic investigations by HANS SCHNEIDERHÖHN. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 3, Report 198, 1932, pages 25-36. From a review of the literature it is observed that many difficulties generally arise in attempts to study the equilibrium of this system. Factors which are deterrents are the strong reactivity of Ca_3PO_4 and the high reaction temperatures produced. The method used for making the melts must be such that the composition of the mixture, during fusion, does not vary due to absorption of impurities from the crucible, and also that it must be possible to hold the temperature above the fusion point for such a period as is necessary for the mixture to combine uniformly. The use of Pt for the crucible, the resistance winding, and thermocouples is satisfactory up to 1600° C. Ir, due to its high cost and volatility would be unsuitable. In the CaO-rich part of the system the temperatures run above 1600° C. The use of ceramic materials for crucibles is impossible due to attack by lime phosphates. Even highly fired crucibles of MgO, ZnO, etc., are rapidly attacked by the melt. P_2O_5 vaporization is another factor. Rh serves well up to 1984° C and its sp.g. of 12.1 against 21.4 for Pt means that much less white metal is needed for the same size crucible. Rh is slightly oxidized by heating in the atmosphere, the formation of its oxide is shown by partial discoloration of the melts. The reaction is not as vigorous as with silicates. 30 references. DTR (5a)

Recrystallization of Aluminum and Some Age-hardening Aluminum Alloys. (Über die Rekristallisation von Aluminium und einigen vergütbaren Aluminiumlegierungen.) R. VOGEL. *Die Metallbörse,* Vol. 22, Apr. 2, 1932, pages 418-419. Tests were made with (1) pure Al of 99.67 Al, 0.13 Si, 0.2 Fe; (2) Al alloy L containing 4.22 Cu, 1.89 Si and 0.41 Fe; (3) Al alloy A with 4.4 Cu, and 0.47 Mn; (4) alloy B with 6.5 Cu and 0.67 Mn. The samples were submitted to plastic deformation at elevated temperatures. In all specimens a peak value was found, i.e. the crystallites start with a maximum grain size at a certain degree of deformation. In order to secure the best physical properties, the alloys were treated at temperatures slightly below the eutectic. The recrystallization temperature and the recrystallization power depend on the alloying elements. Mn greatly reduces the recrystallization power. A marked influence of the deformation speed on the grain size was noticed and the recrystallization velocities were found to be surprisingly large. Differences in the behavior of wrought and cast material were noticed. Lower degrees of deformation result in coarser grain. The cast material exhibits a fine grained structure and the grain boundaries are preserved even at far-going deformations. The Tammann hypothesis on the grain boundary substance is stressed as an interpretation. The grain boundary substance is destroyed to a more pronounced degree by rolling than by compressive strength. Thus rolling results in a smaller grain size. The critical deformation range was found between 5 and 20%. Forging must be carried out at high temperatures. Many light blows cause a coarse grain, if the degrees of deformation are equal. The recrystallization temperature of pure Al is lowered by alloying elements. EF (5a)

The Behavior of Single Crystals of Bismuth Subjected to Alternating Torsional Stresses. H. J. GOUGH & H. L. COX. *Journal Institute of Metals,* Vol. 48, 1932, pages 227-254. Includes discussion. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 320. (5a)

Austenite ⇄ Pearlite Inversion. H. C. H. CARPENTER & J. M. ROBERTSON. *Foundry Trade Journal,* Vol. 46, June 2, 1932, page 341; *Iron & Coal Trades Review,* Vol. 124, May 6, 1932, pages 757, 759. Summary of a paper presented to the Spring Meeting of the British Iron & Steel Institute. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 320. OWE + Ha (5a)

An Automatic Metallographic Polishing Machine. W. F. DAVIDSON. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 89-91. The author describes the methods of preparation of metallographic specimens employed by the Brooklyn Edison Co. Specimens are molded into a standard size and shape of bakelite mounting. The bakelite mounting affords suitable means of holding the specimen in an automatic holder. The automatic holder moves the specimen back and forth across the revolving polishing disc. Photographs illustrate the features of the machine and micrographs show the product. WLC (5a)

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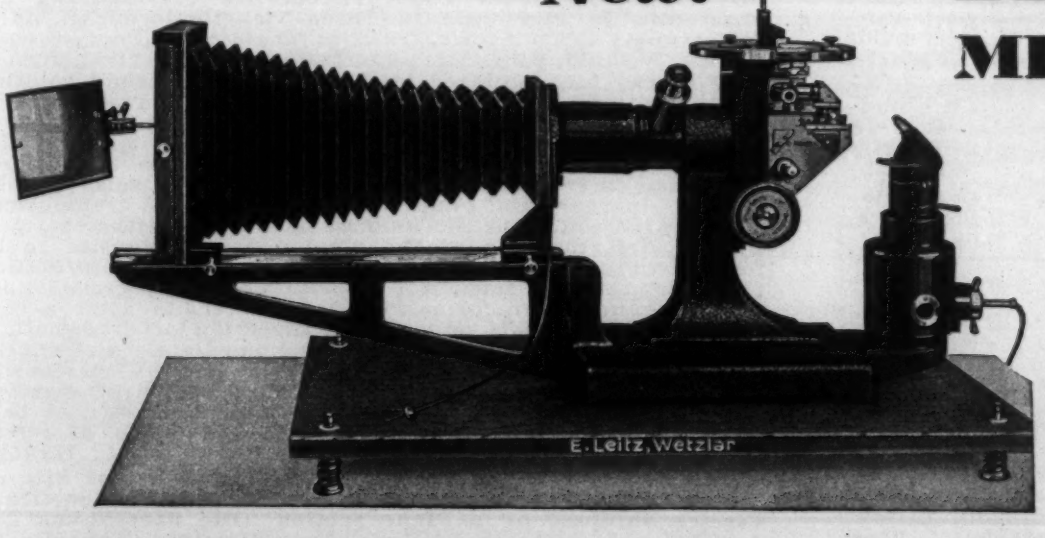

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Structure & X-Ray Analysis (5b)

X-ray Analysis of Aircraft Structural Members. (Röntgendiagnostik an Flugzeugteilen.) F. Hansen. *Schweizer Aero-Revue,* Vol. 7, July 1932, pages 120-121. Description of a small X-ray set. The very handy apparatus is protected against high tension current and radiation; hence there is no danger for the operator. The apparatus is developed by the Röntgen-Müller A. G. and designed for use in aircraft service. Figures show the lighting up of a Messerschmidt tail-group, the condition of the riveting being tested. Furthermore, the apparatus is suited for examining plywood and for many other investigations. GG (5b)

The Crystal Structure of Mercury. (Die Kristallstruktur von Quecksilber.) C. Hermann & M. Ruhemann. *Zeitschrift für Kristallographie,* Vol. 83, July 1932, pages 136-140. X-ray determinations at — 50° C. with Cu K-radiation on single crystals of Hg yielded a rhombohedral lattice arrangement with $a = 3.0_{5\pm5}$ A. U. Previous determinations, being largely in disagreement, the experimenters arrived at the same value formerly established by McKeehan & Cioffi. (*Physical Review,* Vol. 19, 1922, page 444.) EF (5b)

X-Ray of Code Welds. R. Notvest & Cyrus A. Poole. *Industry & Welding,* Vol. 4, July 1932, pages 3-7, 31; Aug. 1932, page 20. According to the revised (1931) Boiler Construction Code X-ray tests of pressure vessels must be supplied with records showing the thickness of plate, distance of film from rear of joint, distance of film from the source of X-rays, voltage impressed on tube, current flowing through tube, time of exposure, type of film used, and type of intensifying screens. The X-ray technique and its admission in code weld testing is discussed. Ha (5b)

Precision X-Ray Methods in the Investigation of Alloys. (Präzisions-Röntgenverfahren in der Legierungsforschung.) J. Weerts. *Zeitschrift für Metallkunde,* Vol. 24, June 1932, pages 138-141. Recently developed methods for highly accurate determinations of lattice parameter are described. Examples of the application of these methods taken from recent literature are listed: (1) the determination of the variation of lattice parameter with composition in isomorphous alloy series, (2) the determination of solubility in the solid state, (3) the study of the age-hardening process, (4) diffraction studies at high temperatures, (5) the study of solution and state of combination of gases in metals, diffusion and corrosion problems. RFM (5b)

X-ray Investigations of the Constitution of Alloys. A. Westgren. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 484-499. Alloy phases are identified by X-ray analysis. Examples are given from the systems Au-Sb, Cu-Zn, Cu-Al, Ag-Sb and Ag-Sn, with brief discussion of carbides of Fe, W and Cr. 22 references. HWG (5b)

Principles of Examination of Materials with Gamma Rays. (Grundlagen der Werkstoffprüfung mit Gammastrahlen.) R. Berthold. *Stahl und Eisen,* Vol. 52, July 7, 1932, pages 666-667. Summarized from a paper by R. Berthold & H. Riehl, *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, 1932, pages 401-406. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 35. DTR (5b)

X-Rays in the Welding Industry. R. A. Stephen. *Engineer,* Vol. 153, Apr. 8, 1932, pages 393-394. Describes use of Philips shockproof mobile X-ray unit developed by Babcock & Wilcox, Ltd., Renfrew. Illustrations are given showing the equipment in use. Radiographs of steel plate welds are shown. 8 references. LFM (5b)

Cementite Crystal Structure. P. R. Kosting. *Metals & Alloys,* Vol. 2, Feb. 1931, page 56. Writer comments upon the finding of S. B. Hendricks, *Zeitschrift für Kristallographie,* Vol. 74, 1930, page 534, regarding the structure of cementite giving the measurement data obtained. WLC (5b)

Laue Patterns with Large Deflection Angles. (Laue-Diagramme mit grossen Ablenkungswinkeln.) W. Boas & E. Schmid. *Metallwirtschaft,* Vol. 10, Dec. 4, 1931, pages 917-919. A brief description is given of the preparation of Laue patterns using angles larger than 45° between the zone axis and incident X-ray beam, which is larger than usual. The advantages include the easy determination of the number of points of a diagram even without exact orientation of the crystal, distinct and immediate location of the zones of the plane perpendicular to the X-ray beam, possibility of examining either thick, strongly absorbing crystal samples or thin surface layers, and the possibility of obtaining Laue patterns with low tube voltages. CEM (5b)

Determination of the Solubility of Cadmium in Zinc by X-rays. (Röntgenographische Bestimmung der Löslichkeit von Kadmium in Zink.) W. Boas. *Metallwirtschaft,* Vol. 11, Nov. 4, 1932, pages 603-604. The difference in results of previous investigators was due to impurities in the metals. For these tests c.p. Zn and Cd were used. The cast bars were rolled and drawn to 3 mm. dia. and homogenized at 350° or 250° C. for several days. By means of precision X-ray measurements the lattice constants were determined. The only lines which could be accurately determined were of the planes $(20\bar{2}4)$ and $(12\bar{3}1)$. The constants increase in proportion to the percentage of Cd up to 1.07 atomic % Cd, which is the eutectic, and then remain constant. For pure Zn at 20° C. $a = 2.6584$ A. U., $c = 4.9353$ A. U.; for Zn with 1.07% Cd $a = 2.6622$ A. U. and $c = 4.9456$ A. U. For the determination of the solubility curve samples containing 4.8% Cd were homogenized at 218°, 156° and 100° C. respectively and then quenched. The lattice constants were determined and the % Cd remaining in solution calculated. The solubility curve checks fairly well with that of Jenkins and Stockdale, rising from 0 at 100° to 2.1% at 266° C. 12 references. CEM (5b)

Lattice Spacings of Iron-Aluminum Alloys. A. J. Bradley & A. H. Jay. *Iron & Coal Trades Review,* Vol. 124, May 6, 1932, page 757; *Foundry Trade Journal,* Vol. 46, May 19, 1932, page 308. A summary of a paper presented to the Spring Meeting of the British Iron & Steel Institute. See "The Formation of Superlattices in Alloys of Iron and Aluminum," *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 345. OWE + Ha (5b)

On the Gliding and Strain Hardening of Zinc Single Crystals. (Über das Gleiten und Verfestigen von Zinkeinkristallen.) M. Straumanis. *Zeitschrift für Kristallographie,* Vol. 83, No. 1/2, July 1932, pages 29-34. A case of pure translation in Zn crystals is described. The translation direction coincides with the $[10\bar{1}0]$ direction as found also by Mark, Polanyi and Schmid. Every one of the individual layers work hardened after it slipped a certain distance. This path optimally amounts to 1600 net distances in the direction $[10\bar{1}0]$ whereby the $(11\bar{2}0)$ plane of the non-deformed crystal endeavors to approach the incline of the $(11\bar{2}2)$ plane. GN (5b)

X-ray Testing of Compressed Gas Cylinders. (Röntgenprüfung an Druckgasflaschen.) *Die Umschau in Wissenschaft und Technik,* Vol. 36, Mar. 5, 1932, pages 192-193. Reports on a general inspection of all compressed gas containers belonging to the Deutsche Reichsbahngesellschaft. EF (5b)

Detection of Faulty Welds. *Electrical Review,* Vol. 110, April 15, 1932, page 557. Describes "Metalix" portable X-ray unit manufactured by Philips Lamps, Ltd., and installed in the Renfrew, Scotland, plant of Babcock & Wilcox, Ltd. Consists of an X-ray tube of heavy loaded capacity, a high-voltage generator, and necessary stands, controls, etc. It is of shock-proof construction and affords complete protection against unwanted radiation. MS (5b)

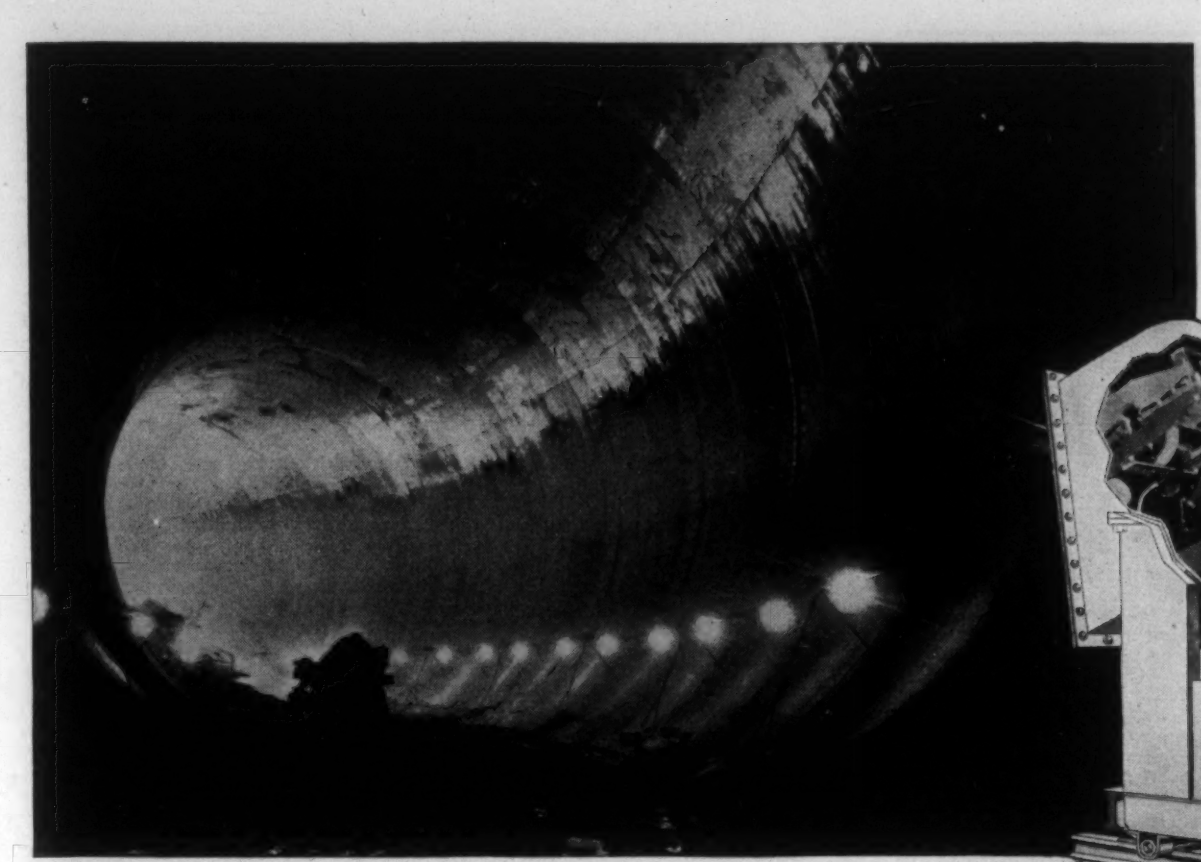
Investigation of the Binary Solid Solutions of Magnesium. (Untersuchungen an binären Mischkristallen des Magnesiums.) E. Schmid & H. Seliger. *Metallwirtschaft,* Vol. 11, July 22, 1932, pages 409-411; July 29, 1932, pages 421-424. Alloys of Mg containing up to 15.25% Al and up to 15% Zn were prepared in wire or bar form. The lower alloys were annealed in boiling S, the higher alloys in a salt bath at the eutectic temperature, for 24 to 100 hours. Precision X-ray photograms of the alloys were taken and the lattice plane distances were calculated from the Debye-Scherrer rings. In both alloys the distances increase with increasing alloy content until the solubility corresponding to the eutectic temperature is reached, after which they remain constant. These points correspond to 12.1% Al and 8.47% Zn. From the lattice plane distances the lattice constants are calculated. By heating the alloys to various temperatures up to 440° C. and quenching in water and making X-ray examinations the solubility curves Al and Zn in Mg were determined. These curves differ somewhat from those determined metallographically, but are considered more accurate, as the precipitation of minute particles can be detected, which cannot be seen under the microscope. Single crystals of Mg alloys with Al up to 8.78 atomic % and Zn up to 1.92 atomic % were prepared from pressed wires by careful repeated annealing and cold working. Examination showed that the orientation of the crystals varied from 10° to 70° between the base and wire axis. These wire samples were used for tensile tests and the stress-strain diagrams for some of them are given, showing a wide variation in the deformation for various crystal angles. The maximum tensile strength is obtained with 4.5% Al and with 1.6% Zn and is 100% higher than for pure Mg in case of the Al alloy and 30% higher in case of the Zn alloy. The maximum energy required for deformation corresponds to the same alloy concentrations. 5 references. CEM (5b)

The Transformation of Austenite into Martensite in Iron-Nickel Alloys under Load. (Ueber die Umwandlung des Austenits in Martensit in Eisen-Nickellegierungen unter Belastung.) Erich Scheil. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 207, July 1932, pages 21-40. The transformation of the face-centered lattice of the γ Fe solid solution austenite into the tetragonal space-centered α Fe solution martensite cannot be explained by a thermal exchange of places of the atoms but must be considered as a special deformation mechanism. How this is influenced by stresses has been investigated on irreversible Ni steels. Tensile stresses increase the temperature at which the transformation begins and also the amount of the martensite formed. Plastic deformations of the steel cause martensite to be formed only in a certain range above the transformation temperature. The formation of sliding planes secure austenite against transformation into martensite after a certain short time, but only in the direction of deformation. The formation of martensite effects immediately a strengthening of the austenite against formation of martensite and sliding planes. The spontaneous formation of martensite is explained by the existence of inner stresses or better by a mechanical instability of the austenite. 25 references. Ha (5b)

The Calculation of Number and Distribution of Size of Spheroid Crystals in Opaque Bodies by Means of Sectional Circles obtained by a Plane Section. (Die Berechnung der Anzahl und Grössenverteilung kugelförmiger Kristalle in undurchsichtigen Körpern mit Hilfe der durch einen ebenen Schnitt erhaltenen Schnittkreise.) Erich Scheil. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 201, 1931, pages 259-264. The theory for finding the number of spheres in a sample and the distribution of the sizes of their radii is derived. Ha (5b)

Lattice Distortion of Cold Drawn Constantan Wire. W. A. Wood. *Chemical News,* Vol. 143, Dec. 4, 1931, page 368. Abstract of a paper presented at the Nov. 1931 meeting of the British Physical Society. The space lattice is found to undergo a large distortion as a result of cold working. Description of a method for determining quantitatively the variation in distortion of cold drawn constantan wire and the changes in electrical resistance and temperature coefficient with the distortion. Ha (5b)

Atomic Structure of KBi_2. Fifth Communication on Metals and Alloys. (Gitterstruktur von KBi_2. 5 Mitteilung über Metalle und Legierungen.) E. Zintl & A. Harder. *Zeitschrift für physikalische Chemie,* Abt. B, Vol. 16, Mar. 1932, pages 206-212. Powder photographs of KBi_2 were taken which revealed a cubic structure with the unit cell edge $a = 9.501 \pm 0.005$ A. U. Based on the density $D = 6.908$, 8 K and 16 Bi atoms are calculated for the elementary body. KBi_2 and $MgCu_2$ have identical structure, and the ratio of the diameters of the components are almost the same. EF (5b)



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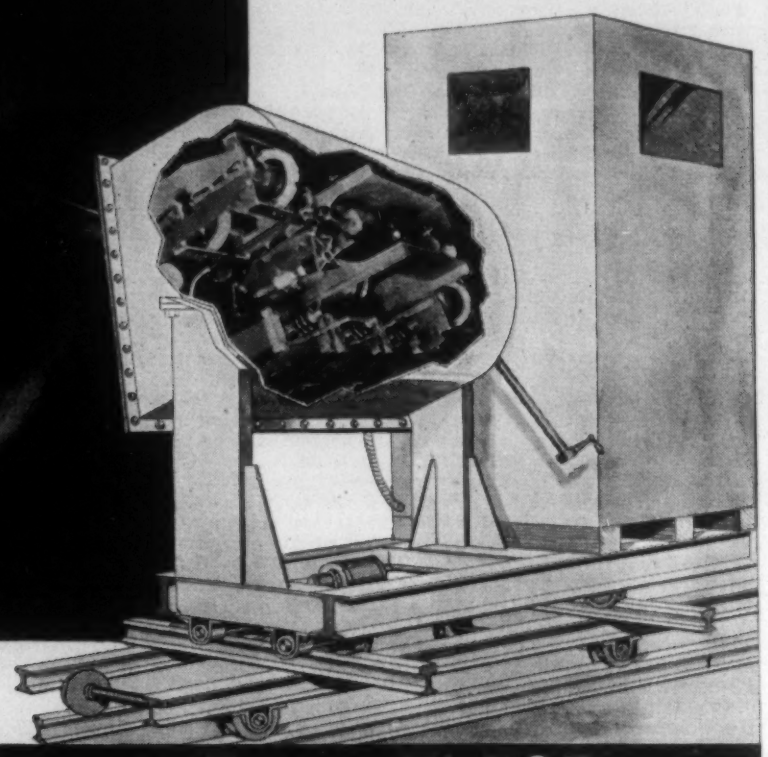

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PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

Strength Tests on Thin Walled Duralumin Cylinders. E. E. LUNDQUIST. *National Advisory Committee for Aeronautics, Technical Note* No. 427, Aug. 1932, 8 pages. The report covers the first series of tests on thin walled cylinders and is part of a broad program for obtaining fundamental design data for structures which fail within the elastic range of the material. Test specimens were duralumin cylinders with radii ranging from 7.5" to 15" and lengths from 2¼" to 45", manufactured from sheet ranging from 0.0105" to 0.0228" in thickness. Test data are recorded in the form of curves indicating the effect of variations in the ratio of radius of cylinder to thickness of sheet on the number of shear wrinkles, the angle between the wrinkles and the shearing stress at failure. An equation for shearing stress at failure is derived from empirical results. JBJ (6)

Methods of Testing Cast Iron. (Beitrag zu der Frage der Prüfungsverfahren für Gusseisen.) E. DÜBI. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 75-108, appendix pages 109-112. Recounts extensive tests of 35 cast irons under the auspices of the Swiss Association for Technical Material Testing, comparing specimens from castings of various wall thickness with separately cast specimens. The separately cast specimens are considered satisfactory for evaluation of the material. Chemical analysis, wall thickness and the hardness characteristics serve to define its properties. HWG (6)

Experimental Investigations on the Relation of Tensile Stresses to Velocity of Deformation. (Experimentelle Untersuchungen über die Abhängigkeit der Zugspannungen von der Verformungsgeschwindigkeit.) H. BEUTLER. *Physikalische Zeitschrift,* Vol. 33, Mar. 15, 1932, pages 247-259. Previous results on combined dynamic and static tests which aimed at a correlation of deformation resistance to deformation velocity are summarized. The next chapter deals at length with Prandtl's theory on the time effect during deformation. The author aims at checking Prandtl's theoretical derivations. Some auxiliary apparatus is incorporated in an Amsler-Laffon Testing Machine and a Losenhausen impact machine. The supplementary equipment and its calibration is fully described and illustrated. The experiments refer to 13 mm. rods of Krupp mild steel with 0.20% C, 0.3% Si and 0.6% Mn and to a commercial brand of Cu. The results with Fe showed too great irregularities to draw convincing conclusions. After extending the velocity range, the tests on Cu yielded a close agreement with Prandtl's equation. The constants of this equation are computed to amount to 175 ± 10 kg./cm.² with reference to Fe in the range of flow and to 85 ± 5 kg./cm.² in the vicinity of the tensile strength. The constant for Cu with reference to the tensile strength yielded 28 ± 2 kg./cm.². Previous tests of Cassebaum on 0.46% C, 0.33% Si, 0.7% Mn, 0.038% P, 0.026% S steel yielded a constant of 50 kg./cm.² in the neighborhood of the tensile strength. Improvements on the testing machine permitted the simultaneous record of the factors: time, elongation and stress. EF (6)

On a Correlation of the Virginal to the Remanent State of Magnetization (Über einen Zusammenhang zwischen jungfräulichem und remanenten Magnetisierungszustand.) H. KÜHLEWEIN. *Physikalische Zeitschrift,* Vol. 33, Mar. 15, 1932, pages 348-351. The ballistic evaluation of hysteresis loops of numerous ferro-magnetic alloys yielded the following rule: the virginal magnetization curve represents the arithmetic medium of the slopes of both remanences after a preceding saturation. The experiments refer to permalloy, perminvar and hexagonal Co-alloys. EF (6)

Constant Work of Fracture as Explanation for the Fracture in Fatigue and Other Loading. (Konstante Brucharbeit als Erklärung für den Bruch durch Ermüdungs-und andere Belastungen.) K. LJUNBERG. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 337-339. In tensile testing the total work of fracture is roughly the same whether the loading is applied steadily or is interrupted after strain hardening begins. But if the material is annealed after strain hardening, the total energy of the 2 loadings is greater. HWG (6)

Cable Testing Machine at the Hoisting Machine Laboratory of the Technische Hochschule in Vienna. (Die Seilprüfmaschine des Lasthebemaschinen-Laboratoriums der Technischen Hochschule in Wien.) FRANZ LIST. *Zeitschrift des Österreichischen Ingenieur- und Architektenvereins,* Vol. 84, Aug. 26, 1932, pages 177-178. Illustrated description of a new type of rope testing machine. GN (6)

Characterization of the Mechanical Properties of Molded Cast Iron Specimens. (Caractérisation des propriétés mécaniques des pièces moulées en fonte grise.) A. PORTEVIN. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 39-55. The author argues in favor of testing specimens from actual castings, as by the shear test, and advocates standardization of specimens for this test and for its correlation with older methods of testing. 61 references. HWG (6)

Bending Tests on Geometrically Similar Notched Bar Specimens. J. G. DOCHERTY. *Engineering,* Vol. 133, June 3, 1932, pages 645-647. Specimens ranging in size from 4x4 mm. to 12x12 mm. were used. The metals tested included: mild steel as rolled, normalized mild steel, normalized 3% Ni steel, annealed Monel metal, annealed Naval brass, phosphor bronze as rolled, annealed phosphor bronze, and normalized 0.3% C steel. The following bending rates were used: 0.05, 6, 50, 150 in./min. and the standard Izod speed. Table is given showing the energy absorbed at various speeds and for the various sizes of specimens. Results show that energy absorbed increases with speed of test, except at highest speed in the more brittle metals. In most cases the energy varied with a power of the size which lay between 2 or 3 but which was usually less than 3. LFM (6)

Improved Device for Recording Instantaneous Tool Pressures in Machinability Studies. O. F. GECHTER & H. R. LAIRD. *Transactions American Society of Mechanical Engineers,* Vol. 54, June 30, 1932, Machine Shop Practice, pages 73-85. A method of measuring the 3 tool-pressure components during the machining of short test pieces by means of the piezo-electric pressure measurement of a quartz cube is described in detail; the electrostatic charges produced on the quartz by the pressure are collected by Cu foils and used for charging condensers and by means of an amplifier can be read on a milliammeter. The whole assembly and procedure is described in detail. Results obtained in this way are reproduced in the form of curves. 22 references. Ha (6)

Tensile Testing by Means of the "Klinometer." (Festigkeitsprüfung mit Hilfe des Klinometers.) A. U. HUGGENBERGER. *Schweizerische Bauzeitung,* Vol. 99, Mar. 19, 1932, pages 151-154. The construction of 2 types of the "Klinometer" and its calibration are discussed. It is shown how bending stresses are determined. GN (6)

Magnetic Effect in Metals. E. G. HERBERT. *Electrical Review,* Vol. 110, Feb. 12, 1932, page 232. Author has developed a stabilizing magnetic process for rendering permanent any selected phase of fluctuations set up by the rotary magnetic process, or by thermal or mechanical means. Presents curves illustrating application of the rotary and stabilizing processes to Co high-speed steel. In one case steel was given 1 turn in the magnetic field at 150° C., aged to maximum hardness and stabilized 3 min. in a stationary field. Resulting hardness was high above previous maximum. In the second, steel was given 1 turn at 200° C., aged to minimum phase, and stabilized 3 min. in a stationary field, with stability below previous minimum. Latest magnetic table for applying processes provides a powerful field in a gap 12" long and adjustable in width, or, by reversing the tables, a more concentrated field in a short gap of varied width. In the rotary treatment, specimen is placed across the gap and rotated once, so as to change the direction of polarization through 360°. High-speed steels are usually treated hot, most favorable temperature depending on the characteristics of steel, but generally not above 250° C. Stabilizing process is applied cold, and consists in placing specimen across the gap for a minute or more. Stabilization must be carried out a specific number of hours after rotary treatment. MS (6)

The Measurement of the Depth of the Impression in the Hardness Test. (Beitrag zur Eindrucktiefenmessung bei der Härteprüfung.) E. FRANKE. *Die Messtechnik,* Vol. 8, July 1932, pages 151-155. The accuracy of the measurement of the depth of an impression made by a ball or cone is shown to depend to a certain degree on the thickening of the edge of the impression. A method is developed which permits taking the influence of the thickened zone into account and arriving at constructions of depth measuring instruments giving accurate indications. Ha (6)

Tensile Properties of a High-grade Electric Arc Welding. (Festigkeitseigenschaften einer hochwertigen Lichtbogenschweissung.) G. CZTERNASTY. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, July 9, 1932, pages 679-682. The tests carried out by hydraulic pressure in an electrically welded boiler until bursting are fully described. Ha (6)

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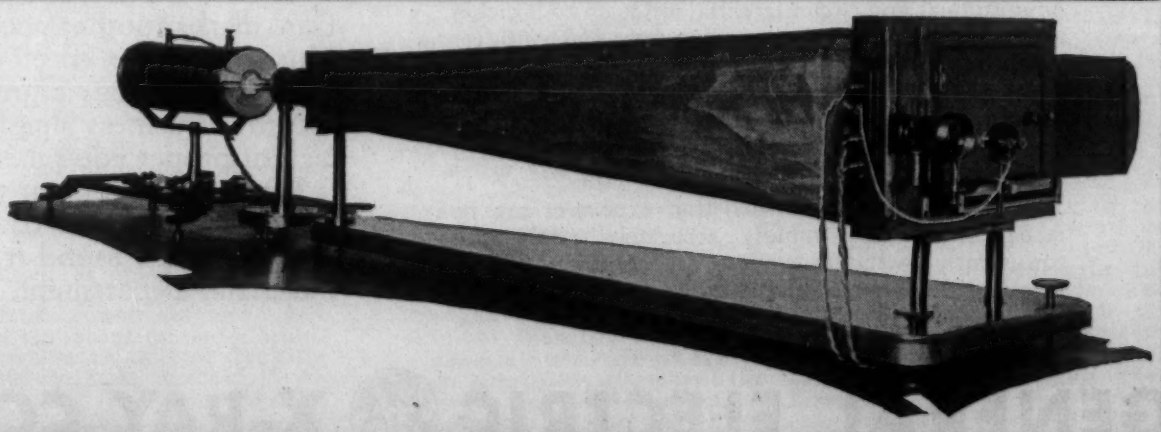

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Experiments on the Theory of Deformation by Slip. (Einige Versuche zur Theorie des schichtweisen Fliessens.) HEINZ MUSSMANN. *Metallwirtschaft,* Vol. 11, July 1, 1932, page 371.

Low C steel bars were normalized at 975° C., then heated for 1 hour in oil at 200° C. and cooled slowly. The bars were stressed under tension until the metal began to flow at the yield point. The load was then released and the bars heated again for 1 hour at 200° C. and stressed under tension again. The yield point occurred at the same load. This was repeated several times with no change in yield point, until the point was reached where the steel increased in strength due to cold working, when the yield point was considerably increased. These results are in accord with the theory of deformation by slip. CEM (6)

Problems of Material Testing. (Materialprüfungsfragen.) A. LEON. *Zeitschrift des Österreichischen Ingenieur-und Architektenvereins,* Vol. 84, July 15, 1932, pages 144-145.

The paper discusses calibrating of testing machines and tests on elasticity, plasticity, toughness, brittleness, hardness, machinability, notch toughness, fatigue strength, creep limit, the use of the microscope, photoelastic methods and X-rays. GN (6)

Modulus of Elasticity of Aluminum Alloys. R. L. TEMPLIN & D. A. PAUL. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 480-486.

See *Metals & Alloys,* Vol. 1, Dec. 1930, page 909. (6)

The Brown Boveri High Power Testing Plant. H. THOMMEN. *Brown Boveri Review,* Vol. 19, May/June, 1932, pages 115-129.

The testing plant at the Brown Boveri works is one of the largest of its kind. A detailed description of the equipment is given. It serves for the development of high capacity circuit breakers, is used for testing fuses, inductances, current transformers, relays, bus-bar models, etc. with regard to their ability to withstand short circuits. The majority of the tests are devoted to researches on the phenomena in apparatus in process of development. An effort has been made to prevent the researches from being disturbed by acceptance tests on standard apparatus. Some particulars on the results of tests are given. MAB (6)

The Method for the Technical Cohesion Determination. (Die Methodik der technischen Kohähionsermittlung.) W. KUNTZE. *Metallwirtschaft,* Vol. 11, June 17, 1932, pages 343-347.

16 references. The ordinary tensile test produces a fracture with deformation of the metal, while in industrial failures of metals fracture usually takes place without deformation due to a combination of stresses. To determine the "parting strength" without deformation a tensile test on a notched test piece is proposed and the principles of this test are discussed. The parting strength St is equal to

$$s_B + \frac{s_{\omega K} - s_B}{1 - K} \times \frac{180}{180 - \omega},$$

where s_B = the regular tensile strength, $s_{\omega K}$ = the strength determined on the notched test bar, K = the ratio of the areas of the notched section to the test bar section, and ω = the angle of the notch. The optimum dimensions for the notched test bar are notch dia. = 3 mm, test bar dia. = 10 mm, K = .09, ω = 135°, and radius of the point of the notch = .1 to .15 mm. Some metals are more sensitive to differences in the dimensions of the notch than others. To determine this another notched bar of the same dimensions except with a 60° notch is tested. The sensitivity of the metal is equal to the differences between the results obtained on the 2 test bars. CEM (6)

Does the Rockwell Test Fail in Case-Hardening? (Versagt die Rockwellprüfung bei Einsatzhärtung?) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Aug. 21, 1932, page 444.

The Rockwell test gives lower values than the most probable ones when the case thickness is below .4-.5 mm. The following results were obtained on a case carburized .18% C steel.

Carburizing Temp.	Carburizing Time hr.	Depth of hardened zone mm.	Depth of case mm.	Hardness of case R_C	Hardness of core Brinell
950° C.	1	.26-.30	.6- .7	49-53	225
950° C.	3	.30-.45	1.0-1.3	59-63	231
950° C.	5	.60-.91	1.4-1.8	63-65	212
900° C.	3	.36-.45	.8-1.0	52-62	205
900° C.	5	.60-.68	1.1-1.3	65-67	213

The above table indicates the fluctuations of Rockwell C due to the diamond pressing through the thin case. In such cases Rockwell testers are to be calibrated anew on the base of comprehensive tests. The German Federal Railway checks Rockwell readings with the Shore tester. GN (6)

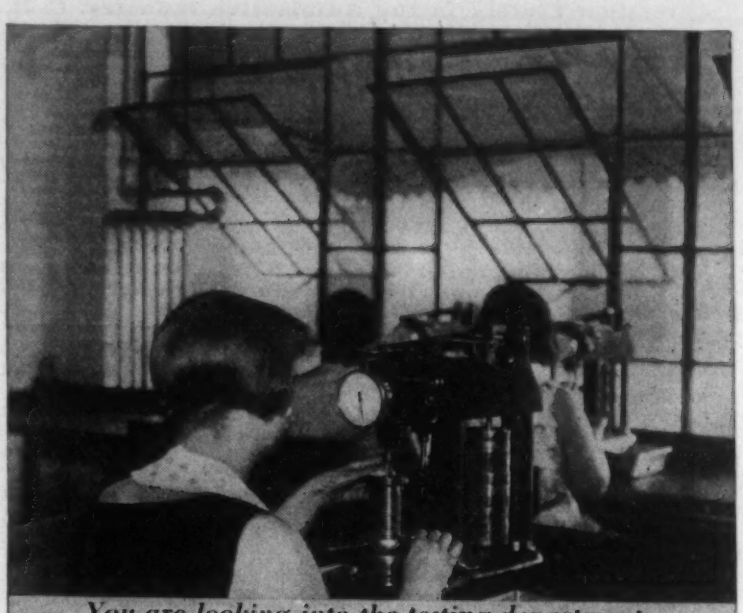
The Resonance Curve as the Base of Dynamic Investigations. (Die Resonanzkurve als Unterlage für dynamische Untersuchungen.) W. SPÄTH. *Ingenieurarchiv,* Vol. 2, Jan. 1932, pages 651-667.

In order to judge the dynamic properties of elastic constructions (bridges, ships, foundations, frameworks, etc.) systematic measurements are carried on by means of artificially excited vibrations. The results of such measurements at various frequencies of the power exciting can be represented in resonance curves as is done for electrical oscillations. The most essential properties of the laws on resonance as well as the peculiarities of the practical measurements of mechanical systems of vibration are discussed and compared with the corresponding electrical occurrences. 10 references. GN (6)

Tensile Strength of Screws under pure Tensile Stress. (Bruchfestigkeit von Schrauben unter reiner Zugbeanspruchung.) K. SCHMIZ. *Maschinenbau,* Vol. 11, Feb. 18, 1932, pages 75-78.

The theoretically calculated influence of notches (a thread taken as a notch) on the tensile strength of screws is determined. RFV (6)

Discussion on Methods of Testing Cast Iron. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 112-131. The great majority of those discussing the problem at Zurich favor tensile and transverse testing on separately cast bars for acceptance tests, though representatives from France, Italy and Spain prefer shear tests on specimens cut from castings. Those from other countries consider the small shear specimens useful for study of castings but not adequate for general acceptance tests. HWG (6)



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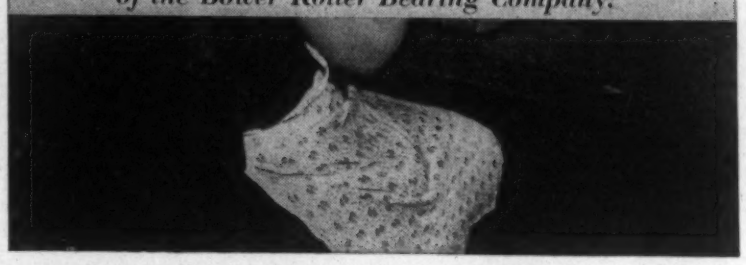

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ELECTRO-CHEMISTRY (7)

Electroplating (7a)

Chromium Plating in the Automotive Industry. C. H. Proctor. *Monthly Review, American Electroplaters Society,* Vol. 19, June 1932, pages 28-34.

Suggested procedures for Ni and Cr plating on sheet Zn and Zn die castings, using either Cu strike or Ni strike preliminary to regular Ni plating which is done in 5 to 8 minutes. LCP (7a)

The Definition and Determination of "Free Cyanide" in Electroplating Solutions. W. Blum. *Transactions Electrochemical Society,* Vol. 60, 1931, pages 143-151.

Includes discussion. See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 11. (7a)

New Means for Supervision of Large Continuous Baths. (Neue Hilfsmittel zur Ueberwachung grosser kontinuierlicher Bäder.) C. Huetter. *Oberflächentechnik,* Vol. 9, May 3, 1932, pages 87-88.

The continuous regulation of electrolytic baths for keeping the pH-value or conductivity constant is carried out automatically. A little cell built into the electrolyte is continually compared with a standard cell; connections from both go to recording instruments and the deviations of the former cell from the standard actuate the regulator for the valves which admit additional solution or fresh electrolyte. A few examples are described. Ha (7a)

Factors Affecting the Smoothness and Mechanical Properties of Electro-Deposited Copper. A. W. Hothersall. *Preprint, Electroplaters & Depositors Technical Society,* London, Mar. 1931, pages 95-122.

32 references. The Brinell hardness range of Cu deposited under widely differing conditions from acid copper sulphate solutions free from organic matter is narrow, the maximum and minimum figures obtained being 63 and 38 respectively. There is considerable tendency for the formation of rough and nodular deposits at high current densities. Growth or nodules may be caused by the presence of certain impurities, but in general are due either to preferential crystal growth or favorably situated nuclei, or to projecting crystal facets, or to adherence to the cathode of electrically conducting particles which may thus constitute projecting nuclei. Once the preferential growth has commenced, rapid increase in the rate of deposition on the prominent points occurs, especially at high current densities, owing to the steep potential gradient through the solution. The relatively small increase of polarization with current density, characteristic of acid copper sulphate solutions free from organic matter, offers little hindrance to this increased rate of growth. Two methods are available for reducing the tendency for rough deposits at high current densities, (1) suitable movement of the solution relative to the cathode and (2) the use of addition agents. Addition agents which give smooth deposits also increase the hardness, and in some cases the ductility of the deposit. No addition agents are available which would work at high current densities, and yet produce a soft deposit. Examination of the mechanical properties of deposits formed under various conditions in solutions containing different addition agents shows that dextrin tends to promote formation of brittle deposits, and gelatin, peptone and phenol markedly improve the smoothness ductility and hardness of Cu deposits. The concentration of either gelatin or peptone is too small for chemical control, but phenol may be used as much as 10 g./l. and can be controlled chemically. LCP (7a)

Electrodeposition of Platinum, Palladium and Rhodium. W. Keitel & H. E. Zschiegner. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 273-275.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 175. (7a)

The Electrodeposition of Ternary Alloys of Copper Cadmium and Zinc from Cyanide Baths. R. C. Ernst & C. A. Mann. *Preprint, The Electrochemical Society,* Vol. 61, Apr. 1932, pages 153-184.

Theories and principles involved in the simultaneous electrodeposition of 2 metals from aqueous baths are reviewed and extended to the deposition of an alloy of Cu, Cd and Zn. The deposition may be carried out in the following bath: CuCN 40.01 g./l.; Cd $(CN)_2$ 2.94 g./l.; $Zn(CN)_2$ 36.14 g./l.; KCN 138.0 g./l. This bath gives a deposit containing approximately 62% Cu, 21% Cd and 17% Zn at 25° C. and 0.3 amp./dm.^{2} The effect of KCN, $NaHSO_3$, NaOH, current density, temperature and dilution on the composition and properties of the deposit were studied in detail and given in tables and curves. High temperature favors Cd deposition and low temperature favors Cu deposition, but temperature has practically no effect on Zn. KOH favors Zn deposition and retards Cu deposition, but has no effect on Cd deposition. KCN retards Cu deposition, while it promotes Cd and Zn deposition. LCP (7a)

Chromium Plating Light Alloys. (Das Verchromen von Leichtlegierungen.) K. Altmannsberger. *Chemiker-Zeitung,* Vol. 56, Mar. 26, 1932, page 247.

For the preparation of the Al surface the following solution is recommended: Dissolve 300 g. sheet Zn in 5 kg. hot NaOH solution of 30-35° Be., let stand 4 hours, add 100 g. ZnO, boil and cool. The parts to be plated are first cleaned electro-chemically to remove oil, then dipped in the zincate solution at 40-45° C. until silver white Zn is deposited. 5 Al alloys of different compositions were plated as a test. They were first polished, the Al-Cu alloys polishing better than the Al-Si alloys which were rough and dark. After the Zn dip they were Ni plated in a solution containing 34.5 g. Ni/l. at 1.8 amps./dm.^{2} and 3.8 volts, then Cr plated in 406 g. CrO_3/l. and 3.66 g. H_2SO_4/l. at 41° C. and 3.8 volts for 3 minutes. All samples were perfect. On other samples Cu plated in cyanide solution instead of dipped in zincate solution, but otherwise treated similarly, the Cr came off the edges. Al alloys plated with Cr directly oxidize and become gray. CEM (7a)

The Change in Reflecting Power Caused by Tarnishing Electrodeposited Silver-Cadmium Alloys. L. E. Stout & William G. Thummel. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 337-351.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Electrodeposition of Iron, Copper and Nickel Alloys from Cyanide Solutions. Part 1. L. E. Stout & C. L. Faust. *Transactions Electrochemical Society,* Vol. 60, 1931, pages 271-296.

See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 38. (7a)

How to Handle Nickel Solutions. E. Schor. *Metal Industry,* N. Y., Vol. 30, May 1932, pages 187-188.

Some practical points are given regarding the care of Ni solutions and of Ni anodes. PRK (7a)

Significance of a Quantitative Analysis of a Plating Solution. L. E. Stout. *Monthly Review, American Electroplaters Society,* Vol. 19, June 1932, pages 17-23.

Emphasis is laid upon the importance of control of plating solutions by constant chemical analysis, and the understanding on the part of the operator of the relation between an analysis and the functioning of a plating bath. LCP (7a)

The Stability of Cadmium Cyanide Plating Solutions. S. Wernick. *Transactions Electrochemical Society,* Vol. 60, 1931, pages 129-142.

Includes discussion. See *Metals & Alloys,* Vol. 3, April. 1932, page MA 94. (7a)

A New Abnormality in the Properties of Aqueous Solutions of Cadmium Salts. Elmer Tesche & Pierre J. Van Rysselberghe. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 353-357.

Includes discussion. See *Metals & Alloys,* Vol. 2, June 1931, page 112. (7a)

Repair of Worn Parts by Electrodeposition of Iron. T. P. Thomas. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 29-30.

A commercial method is described for salvaging worn or undersized steel parts, such as plug gages, arbors, reamers, motor shafts, etc., by electrodeposited Fe. A good plating bath is: ferrous ammonium sulphate, 2.5 lbs./gal. and 5 oz./gal. of ferrous carbonate freshly precipitated and a handful of powdered charcoal. Parts not to be plated are to be protected. It is necessary to plate a few thousandths of an inch and then grind to size. A good current rate is 3 amp./in.^{2} Ha (7a)

On the Effect of Mercury in Zinc Cyanide Plating Solutions. M. deKay Thompson & W. E. Charles. *Transactions Electrochemical Society,* Vol. 60, 1931, pages 123-127.

See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 38. (7a)

Determination of the Thickness of Film of Electroplated Cr. (Sulla determinazion dello spessore dei depositi elettrolitici di cromo.) O. Macchia. *Industria chimica,* Vol. 7, June 1932, pages 717-725.

The thickness of the film of plated Cr is determined by dissolving the Cr from a known area with HCl, the rest of the article being protected with a film of paraffin. Covering the area with a rubber stopper and waxing around this is a convenient process. The weight of Cr dissolved divided by the area gives the average thickness. An extended review and bibliography is included. AWC (7a)

Electro-Tin Plating. R. E. Maeder. *Monthly Review, American Electroplaters Society,* Vol. 19, July 1932, pages 12-16.

Sn plating solution made of sodium stannate, 32 oz./gal., stannous chloride, 1/32 oz./gal. was found to be stable if anode current density does not exceed 15 amp./ft.^{2} Stannous chloride must be controlled carefully to maintain the throwing power. Cathode current density was 14.45 amp./ft.^{2}, bath temperature 110°-130° F.; pH, 11.6; plating time, 25 minutes on brass or Cu. Salt spray test 400-600 hours. LCP (7a)

American and Continental Practice in Nickel Deposition. W. T. Griffiths. *Preprint, Electroplaters & Depositors Technical Society,* London, June 1931, pages 51-70; abstract, *Metallurgist,* Jan. 1932, pages 13-15.

American, French and German practice of Ni plating are described and illustrated by photographs. The author points out the trend toward using hot rapid plating solution and automatic equipment. See also "Nickel Plating Practice Abroad," *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 270. VVK+LCP (7a)

Tin Plating of Cast Iron Pistons. G. W. Glasson. *Monthly Review, American Electroplaters Society,* Vol. 19, July 1932, pages 10-12; *Brass World,* Vol. 28, July 1932, page 141.

Operating cycle of tin plating is given as follows: (1) Cast Fe pistons ground in a solution of Na_2CO_3, (2) Electrolytic cleaning, 2-3 minutes, in solution of Na_2CO_3, Na_3PO_4 and NaOH, (3) Cold water rinse, (4) Acid dip, 3-5 minutes in 10% HCl, (5) Cold water rinse, (6) Alkali dip, cold NaOH, 2 oz./gal., (7) Cold water rinse, (8) Tin plating 60 minutes at 20-25 amp./ft.^{2} (0.001" deposit). Bath contains sodium stannate, 12-14 oz./gal.; temperature 140°-180° F. WHB+LCP (7a)

Chromium Deposits Directly on Aluminum. Harold K. Work & Charles J. Slunder. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 429-435.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Recent Advances in Metal Protection. *Brass World,* Vol. 28, Aug. 1932, pages 161-162.

A review of the work of some important investigations on Cd and Zn electrodeposition on light metals, and immersion coatings. WHB (7a)

Progress in the Electrodeposition of Tin. *Tin,* June 1932, pages 10-11.

Tin plating as a means for protecting Fe or steel against corrosion is discussed in general and it is explained that an effectively coated metal acts as a single metal while, if the coating is discontinuous, the base and the discontinuous coating act as 2 metals which are liable to corrode by forming a couple and causing electrolytic action. Testing methods of tinned material for effective coating are described and it is stated that present methods of electrodeposition of Sn on Fe and steel plate are entirely successful both from the commercial and the mechanical point of view. Ha (7a)

Chemical Control of Cyanide Silver Plating Solutions. R. M. Wick. *Monthly Review, American Electroplaters Society,* Vol. 19, July 1932, pages 5-10.

Analytical procedure for the determination of free cyanide, silver and carbonate. See also "The Analysis of Cyanide Silver-Plating Solutions," *Metals & Alloys,* Vol. 3, May 1932, page MA 129. LCP (7a)

The Lead Plating Methods, in particular, Homogenous Lead Lining. (Die Verbleiungsverfahren, insbesondere die homogene Verbleiung.) H. Krause. *Feinmechanik und Präzision,* Vol. 40, June 1, 1932, pages 106-108.

The methods for obtaining a dense, non-porous, sufficiently thick and uniformly thick coating of Pb especially on Fe or steel surfaces are reviewed. Besides the older methods of lining by first tinning and then melting the desired thickness on the surface, recently electrolytic methods have been developed even for thicknesses up to 10 mm. Electrolytically deposited Pb is softer than the melted-on Pb; with this method metals like Al or cast Fe can be leaded for which the melting method fails. They must be properly cleaned by sand-blasting. Cu and Cu alloys must first be Ni plated or tinned. A Pb thickness of 0.075 mm. is generally sufficient for a dense coating; for chemical apparatus 1.75 mm. High voltage and high current density give best results, otherwise the coatings may be porous. Thinner coatings can be produced in alkaline baths, thicker ones are now made in silico-hydro-fluoric, boro-hydro-fluoric and perchlorate baths; in addition the following electrolyte is recommended: 8.25 kg. lead silico-hydro-fluoride, 7 kg. silico-hydro-fluoric acid, 10 g. gelatine, 100 l. H_2O. Current density about 1 amp./dm.^{2}, bath voltage 0.15 to 0.2. Ha (7a)

Electrodeposition of Silver from Sulfate, Nitrate, Fluoborate and Fluoride Solutions. Edward B. Sanigar. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 307-327.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Electroplating on Aluminum from Cyanide Solutions. Harold K. Work. *Transactions Electrochemical Society,* Vol. 60, 1931, pages 117-122.

Includes discussion. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 65. (7a)

Progress of the Hot Nickel Solution. Oliver P. Watts. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 379-384.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 174. (7a)

Plant Practice for Nickel-Plating Aluminum. A. V. Re. *Preprint, The Electrochemical Society,* Vol. 61, Apr. 1932, pages 139-141.

Satisfactory, thoroughly adherent electrodeposits of Ni on Al articles may be obtained by carefully cleaning the surface in a hot alkaline peroxide bath followed by a strong H_2SO_4-HNO_3 bath, containing $FeCl_3$, flashing with brass and finishing with a standard Ni bath. The under-coat of brass greatly increases the uniformity and adhesion of the electroplate to the Al surface. Full directions of procedure are given. LCP (7a)

European Practice of Nickel Plating. (Europäische Vernicklungspraxis.) *Werkzeugmaschine,* Vol. 36, July 15, 1932, pages 244-246.

Semi- and completely automatic Ni plating finds increasing use in Germany. Plating baths of high efficiency are used in all European countries. Particularly in France and Belgium hot Ni baths with a high content of Ni are used, but Germany prefers automatic Ni plating. In Italy medium current densities are preferred. A survey of the Ni plating practice of the most important European automobile manufacturers is given. GN (7a)

The Determination of Output in Electroplating Plants. (Zur Leistungsermittlung in Betrieben der Galvanisierung.) P. F. Wintersberger. *Oberflächentechnik,* Vol. 9, July 5, 1932, pages 135-136.

The calculation of a certain output-factor for the determination of the efficiency in an electroplating plant is explained with particular reference to Ag plating. This factor is a quotient of weight of deposited metal divided by the number of labor hours. The determination of these 2 factors is discussed and illustrated by an example, taking into account different qualities of the product. Ha (7a)

Electrometallurgy (7b)

Electrolytic De-tinning. (Elektrolytisches Entzinnen.) *Emailletechnische Monatsblätter,* Vol. 8, July 1932, page 52.

Description of a new method for reclaiming Sn from Sn sheet scrap. A solution of caustic potash is used as electrolyte which contains certain ingredients for avoiding the simultaneous removal of Fe. Sn is deposited and goes in the slime of the Fe cathodes. The slime is melted and gives Sn of 99.7% purity. GN (7b)

The Production of Zinc by Electrolysis. (II) Harry Hey. *Chemical Engineering & Mining Review,* Vol. 24, Mar. 5, 1932, pages 197-205.

Electrolysis of $ZnSO_4$ solution is effected under the general conditions of: (1) the so-called low-acid, low current density process where the feed solution contains 100-150 Zn./l., H_2SO_4 90-140 g./l., and current density of 25-45 amp./ft.^{2} and (2) the Tainton high-acid, high current density (100 amp./ft.^{2}) process. 9 variables which affect current efficiency or cell voltage, or both, are: current density, acidity, Zn concentration, anode material, temperature, length of deposition period, spacing between electrodes, addition agents, and impurities in the electrolyte. Toxic impurities of $ZnSO_4$ electrolytes include Sb, Co, As, Ni, Cu and Ge. Mn tends to reduce the conductivity of the electrolyte, increasing the cell voltage. K-, Na- and Mg-sulphates affect the conductivity, Cd reduces the grade of Zn. Pb, like Cd, may deposit with the Zn. Curves show the factors affecting current efficiencies of Co bearing solutions. Electrodes, melting and casting, and treatment of residues are discussed. The following features should be explained: (1) the reason for the observed effects of toxic impurities, (2) the manner in which glue and other addition agents restrain the toxicity of Co and similar impurities, (3) the anode reactions, and (4) the reason impurities, particularly Sb, modify the structure of the deposited Zn. WHB (7b)

METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Mechanical Aids to Hot Galvanizing. Wallace G. Imhoff. *American Machinist,* Vol. 76, May 12, 1932, pages 616-618.

The treatment of steel and Fe before dipping into the hot Zn in order to obtain a properly adhering Zn coating is discussed and practical hints are given. A flux treatment and heating to 850°-875° F. is recommended, the Zn bath should have at least 850° F. for large production and for slow work at least 825° to 850° F. Soldered articles must show perfect seams as the Zn will not fill holes. Ha (8)

Galvanizing of Interior Surfaces of Containers. (Galvanisches Ueberziehen der Innenflächen von Behältern.) Friedrich Huth. *Emailletechnische Monatsblätter,* Vol. 8, Sept. 1932, pages 67-68.

According to German patent 536,013 this type of galvanizing is to be facilitated by using an anode similar in shape to that of the container. This means a considerable saving of electric current. GN (8)

Zinc Used in Metalware Galvanizing. Wallace G. Imhoff. *American Metal Market,* Vol. 39, July 2, 1932, pages 5, 8; July 6, pages 5, 8; July 8, page 5; July 9, 1932, page 5.

Discussed from 2 viewpoints: (1) the amount of Zn used, and (2) the kind of metal used. In order of quality zincs may be rated as follows: (1) electrolytic Zn; (2) primary distilled Zn; (3) secondary distilled Zn; (4) remelted Zn. The author is very familiar with this subject and the article will be interesting to refiner, mill-man and consumer alike. The following features of the metals should be carefully observed in all galvanizing work: (1) should be absolutely clean on the top surface; (2) the top surface of the metal should have a light blue color and not be yellow, bronze or purple; (3) the surface of the Zn should be very smooth and have almost a velvet-like feel; (4) an Fe content above .08% indicates that the production has been pushed, which indirectly tends to give a metal that is sluggish and one with little "life" in it; (5) the metal should not show blisters or gas cavities on the top surface; (6) generally, brittle zincs are not good for galvanizing; (7) a good high quality Zn will show a clean, bright fracture with very large bright crystal faces—the fracture should not be observed at the chill marks of the slab, but across the full thickness of the slab; (8) the chemical analysis is only an indicator of the quality of the metal and is not a final or definite answer as to the quality of the Zn; (9) high quality Zn has a mirror-like surface which retains this "mercury-like" appearance for a long time. DTR (8)

Magnesium Alloy Protection by Selenium and Other Coating Processes. G. D. Bengough & L. Whitby. *Journal Institute of Metals,* Vol. 48, 1932, pages 147-163; *Korrosion und Metallschutz,* Vol. 8, Apr. 1932, page 93.

Includes discussion. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 300. EF (8)

Metal Spraying. (Das Metallspritzverfahren.) Walter Hahn. *Apparatebau,* Vol. 44, Sept. 16, 1932, pages 126-127; Oct. 14, 1932, pages 146-147.

The paper discusses advantages and application of metal spraying, with special reference to Al coating for various purposes. Combined Al-Zn coatings and zinc coating of small Fe articles are discussed. Use of such coatings in case-carburizing to protect areas not to be case hardened is considered. Elimination of defects and pipes in steel and non-ferrous metal castings is finally dealt with. GN (8)

Metallic Depositions Without External Source of Current. (Metallabscheidungen ohne äussere Stromquelle.) A. Kutzelnigg. *Zeitschrift für Elektrochemie,* Vol. 38, Mar. 1932, pages 154-158.

The methods and mechanism of depositing metals in thin layers by simply immersing a metal in a solution are discussed; the solution can be cold or hot, or the metal is "rubbed" onto the surface. The position of the 2 metals in the series of electrical potentials determines the success of the process. Various methods and solutions for depositing Au, Ag, Cu, Sn are described. 28 references. Ha (8)

Modern Galvanizing. (Neuzeitliche Verzinkung.) L. Arndt. *Zeitschrift für die gesamte Giessereipraxis, Eisenzeitung,* Vol. 52, Nov. 22, 1931, pages 395-397.

Detailed description of the 2 hot galvanizing processes, the wet or salammoniac process and the dry process. A thorough cleaning, mechanically or better chemically, is prerequisite to a successful galvanizing. The extent of pickling and the use of inhibitors are considered. In hot galvanizing, 2% Al are added to the Zn bath, to improve the corrosion resistance. The Zn consumption has been cut down to less than 1 kg. Zn/2m.^{2} of galvanized area. Additions of Sn, Bi, Sb and other metals induce an "ice flower" appearance on quenching. The best working temperature is 440°C. At 491.5°C. a glossy coating is obtained. The critical temperature is 510°C. which should never be passed. The articles are kept in the melt until they attain the temperature of the latter. The second part of the paper is devoted to the wet galvanizing process. The economy, operation, composition of the electrolyte and the mechanism of alkali and cyanide galvanizing are discussed. EF (8)

X-Ray Investigations of Electrolytically Oxidized Aluminum. (Roentgenographische Untersuchungen an elektrolytische-oxydiertem Aluminium.) E. Schmid & G. Wassermann. *Aluminium, Hauszeitschrift V. A. W. und Erftwerk,* Vol. 4, Apr.-June 1932, pages 100-106.

The nature of the Al oxide films produced electrolytically was investigated by X-rays. 4 modifications of Al hydroxide are known of which 2, Bayerite and Hydrargillite, have the constitution $Al_2O_3 \cdot 3H_2O$. The 2 others, Boehmit and Diaspor, have the constitution of $Al_2O_3 \cdot H_2O$. The last one has so far not been produced artificially and is, therefore, very likely not contained in the electrolytically produced oxides. X-ray pictures and characteristics at different temperatures are reproduced. Eloxal, the technically used oxidation for Al, consists of γ Al oxide of crystalline, very fine grained structure. Up to 400° C. the diagram of Eloxal is not greatly changed but annealing at 600° C. and higher show the diagram of γ oxide with collective crystallization. A treatment of Eloxal with high-pressure water vapor converts it into Boehmit. The crystallizability of the hydroxide is greater than that of the oxide. 19 references. Ha (8)

INDUSTRIAL USES & APPLICATIONS (9)

Construction and Manufacture of Steel Wire Rope. G. C. HODGSON. *Canadian Mining & Metallurgical Bulletin* No. 241, May 1932, pages 258-267.

Discussion of article in *Metals & Alloys*, Vol. 2, Nov. 1931, page 262. AHE (9)

Fourdrinier Wires and Cloths. KURT JAHN. *Wire & Wire Products*, Vol. 7, July 1932, pages 221-223.

The requirements and the manufacture of these wire products are described in detail. Ha (9)

Light Alloys in Aircraft. H. W. GILLETT. *American Metal Market*, Vol. 38, Dec. 5, 1931, pages 4, 10.

Paper presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 246. DTR (9)

Industrial Alloys of Tin. PAUL G. J. GUETERBOCK. *Metal Industry*, London, Vol. 40, Jan. 15, 1932, pages 61-62, 74.

The uses of Sn and its alloys are discussed. PRK (9)

Powder Metallurgy. CHARLES HARDY. *Metal Industry*, N. Y. Vol. 30, May 1932, pages 179-180.

The recent developments in powder metallurgy as well as its applications are briefly mentioned. PRK (9)

Nickel Clad Steel Plate for Equipment. ERLE G. HILL. *Chemical & Metallurgical Engineering*, Vol. 39, May 1932, page 268.

A new Ni clad steel plate with a bright face free of nickel-oxide is now available in sheets of extra heavy weight and very large size. PRK (9)

Experiments with Ball Bearings of Stainless Steel. (Versuche mit Kugellagern aus nicht rostendem Stahl.) WALTER HEINEN. *Die Chemische Fabrik*, Vol. 5, May 4, 1932, pages 140-142.

For ball bearings which cannot be lubricated properly or which run in a corrosive liquid or atmosphere it is of great advantage to use a non-rusting steel. It is not possible to electroplate the balls or apply a protective coating to them which will withstand the wear. Tests were made on a medium size ball bearing in which the balls and race were made of V3MH stainless steel. The Rockwell hardness of the balls was C 59 and of the race C 57. Those made of standard steel have a hardness of C 62 and C 65. The load on the bearing was 120 kg. When run in water without oil the ball bearing lasted only a few hours. With a mixture of 70 parts of water to 1 part of oil the bearing ran 800 hours without harm, but the play was increased. With the 70:1 lubrication and iron rust introduced from other steel parts the bearing lasted for 164 hours and then began to crumble on the surface. Stainless steel ball bearings are satisfactory if they receive at least a small amount of lubrication and if they are kept free from rust from other parts. Their load carrying capacity is somewhat less on account of their lower hardness. CEM (9)

Platinum and Its Alloys in Dentistry. (Platin und seine Legierungen in der Zahnheilkunde.) KARL FALCK. Festschrift zum Fünfzigjährigen Bestehen der Platinschmetze (1881-1931). G. Siebert, G. m. b. H. Publisher G. M. Alberti's Hofbuchhandlung, Hanau, pages 31-50.

In 1927 the world production of Pt was 5,675 kg. of which dentistry used 850 kg., or 15%. Pt pins or hooks were used in porcelain or mineral teeth as early as 1808. The S. S. White Co. in America was founded in 1844, and America became the leading manufacturer of artificial teeth till 1914, when the world production was about 120 million, of which America produced 65-70%. The world production in 1929 was about 700 million. Pt pins are used as a means of attaching the tooth to the vulcanite. Falck estimated that in 1914 about 1575 kg. of Pt was required as different kinds of attachments for artificial teeth, but the actual amount used was less, due to the use of substitutes for Pt. Other uses of pure Pt in dentistry include shells for holding the pins, crowns, matrices for porcelain inlays and porcelain-jacketed crowns, and rings or bands. For these purposes sheets of 0.15 to 0.2 mm. in thickness are generally used. A Pt-solder contains 82% Ag. 17.5% Pt, and 2-3% Cu. In place of Pt, alloys have been used, such as Pt with 2% Ir, 25% Pt and 75% Au, Pd with Au, and Ni with a gold plate. Falck reports the yield strength and breaking strength in kg./mm.^{2} for 3 alloys: Pt with 2% Ir, 5-6 and 9.0; Ni with Au plate, 7-8 and 17.6; 18 karat Pt-Au (Primodor) 11-12 and 19.3 respectively. These tests were on wire of 0.7 mm. diameter which had been heated 2 min. at 800° C. Pt is added in small amounts of the alloy used in amalgams and improves the properties and color. Pt is used in making heating elements for electric furnaces and in thermocouples. Pt is used as an alloying element with Au and especially with Au-Ag-Cu alloys. Replacing 5-6% of Au with Pt raises the Brinell hardness from 70 to 160. Replacing 5% Au in a 20 karat alloy with 5% Pt greatly refines the grain. The properties and uses of alloys of 18-20 karat containing up to 25% Pt are discussed in the last 5 pages and 4 photomicrographs are given. OEH (9)

Nickel Cast Iron in the Diesel Engine. A. B. EVEREST. *Gas & Oil Power*, Vol. 26, Nov. 5, 1931, pages 335-336; *Transactions Institute of Marine Engineers*, Vol. 43, Dec. 1931, pages 554-555.

A brief exposition of the technical and practical value of Ni-bearing cast Fe for heavy oil engine work. (9)

Marble and Metal. E. H. FAILE. *Metalcraft*, Vol. 8, Mar. 1932, pages 104-109.

In the 11 story Goelet Building at 608 Fifth Ave. New York, Al was used to make an attractive design with the marble in the interior of the building. Al was also used in the exterior of the building wherever metal was necessary. In such a building, Portland cement mortar and not lime mortar must be used as the latter is corrosive to the metal. Anchors of Al or at least galvanized material should be used. Al should also be painted on the back side with an asphaltum paint. VVK (9)

Specifications for Architectural Aluminum Work. *Metalcraft*, Vol. 8, Apr. 1932, pages 168-170.

The general specifications and requirements, standards of materials and workmanship, etc. in Al work worked out by E. H. Faile & Co. for use in the Goelet Building, N. Y. See abstract above. VVK (9)

Seadrome Project Requires 17,000 Tons of Iron, Steel. A. H. ALLEN. *Steel*, Vol. 90, Feb. 15, 1932, pages 28-29.

After 17 years of development work, plans have been completed and approved for the construction of the first mid-ocean seadrome, to be located about 350 miles from New York on the New York-Bermuda steamship route, at an estimated cost of $4,000,000. 7 additional seadromes are contemplated at 500-mile intervals on the southerly route between New York and Europe. These seadromes will be equipped to provide every convenience and necessity for aircraft and trans-oceanic passengers. JN (9)

Extra Long Cylinder Piles Carry Column Loads to Rock. W. T. MCINTOSH. *Engineering News-Record*, Vol. 109, July 7, 1932, pages 5-7.

Study of ground conditions for Sterrett-Lehigh manufacturing and distribution center building in New York City led to conclusion that a foundation of steel pipe piles to rock was best suited to the conditions. Steel-pipe pile foundations consist of groups of steel cylinders driven with open ends to rock, excavated, cut off at the required grade, filled with concrete and capped with reinforced concrete. The cylinders are generally 10 to 18" in diameter, with ⅜ to ½" shells. They are of seamless or lap-welded steel tubing, generally 20 to 30 ft. long. When longer piles are required, two or more lengths are joined together with internal or external sleeve couplings. Tests show that settlement of ⅛" under 1½ times the designed load have taken place and the steel-pipe pile foundation is entirely satisfactory. CBJ (9)

Steel—Its Principal Problem. CHARLES F. ABBOTT. *American Metal Market*, Vol. 39, Feb. 18, 1932, pages 6-7.

Presented at 8th Annual Conference of Iron, Steel & Allied Industries of Cal., Santa Barbara, Feb. 12, 1932. Steel suggested for steel residences, road guards and roadways. DTR (9)

This Trend to White Metals. L. L. MALMSTROM. *Metalcraft*, Vol. 8, Mar. 1932, pages 128-133.

A general review of the use of white metals, such as Al, Ni-Ag or German Ag, Ni bronze, Cr-Ni steel, Cr steel and Monel metal, in buildings. VVK (9)

Metals and Alloys in Modern Building. GEORGE MAGULO. *American Metal Market*, Vol. 38, Dec. 1, 1931, page 7.

Paper presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys*, Vol. 3, July 1932, page MA 215. DTR (9)

The Application of Electrically Welded Hollow Bar Profiles in Steel Construction. (Die Anwendung von elektrisch geschweissten Hohlstabprofilen im Stahlbau.) F. MERKEL. *Elektroschweissung*, Vol. 3, May 1932, pages 88-91.

The author shows in a series of examples that the application of welded hollowbar profiles offers advantages due to the favorable static effects, the saving in weight and the simple type of construction. GN (9)

Characteristic Curves of the Aluminum Rectifying Cell. L. L. BARNES. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Ser. 7, Vol. 13, Jan. 1932, pages 76-81.

This cell is useful as a rectifier for charging storage batteries from A. C. supply. The cell consists of Al and Pb electrodes in a solution of sodium borate. Curves are worked out and characteristics discussed under varying plate sizes and operating temperatures. RHP (9)

Practical Application of Alloy Steels to Locomotives. C. E. BARBA. *Transactions American Society of Mechanical Engineers*, Vol. 53, 1931, Railroads, pages 1-9.

The means of reducing locomotive maintenance costs by the use of new ferrous metal products are discussed and the different alloys reviewed with respect to their proper use in the different parts of a locomotive. Properties of materials are given. Ha (9)

Bearing Metals. CHRISTOPHER H. BIERBAUM. *American Metal Market*, Vol. 38, Dec. 12, 1931, pages 3, 10.

Presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys*, Vol. 3, July 1932, page MA 214. DTR (9)

Copper as a Material for Water Pipes. (Kupfer als Baustoff für Wasserleitungen.) KURT KASSLER. Deutsches Kupfer-Institut, Berlin, 1930. Paper, 6 x 8¼ inches. 63 pages.

Data on the sizes, prices, uses and working of Cu pipe are given. The advantages of Cu pipe for all kinds of piping are freedom from rusting, increased capacity due to lack of tuberculation and ease of working. V. V. Kendall (9)—B—

Dynamo and Transformer Steel Sheets as Material. (Dynamo- und Transformatorenblech als Werkstoff.) GEO. KEINATH. *Archiv für Technisches Messen*, Vol. 1, May 13, 1932, Section Z911-1, page T63.

The various qualities of sheets and their applications in electrical machines and instruments are discussed and the standard measurements according to German rules described; numerical values for mechanical dimensions, bending test, losses, aging, are given and the taking of samples explained. Ha (9)

Calculative Investigations on the Flow Range of Steel Beams with Consideration of the Equalization of the Moments. (Rechnerische Untersuchungen über die Grösse des Fliessbereiches in stählernen Durchlaufbalken unter Berücksichtigung des Momentenausgleichs.) FELIX KANN. *Bautechnik*, Vol. 5, July 8, 1932, pages 105-109.

On the base of the pioneer tests of Maier-Leibnitz (*Bautechnik*, Vol. 1, 1928, Nos. 1 & 2, Vol. 2, 1929, No. 20) on the course of the plastic deformation in steel beams the author develops an analytical method for accurately determining the plastic range. The paper finally points out that ways and means should be developed for measuring the strain figures in running beams under increasing loads and to compare such measurements with the calculations presented in the paper in order to check the accuracy of the theory on the equalization of the moments. 7 references. GN (9)

A New Orthodontic Mechanism: The Twin Wire Automatic Appliance. JOSEPH E. JOHNSON. *Journal American Dental Association*, Vol. 19, June 1932, pages 997-1011.

The metallurgist's interest is that the author uses hard stainless steel wires of .009" to .014" diameter and finds that two small wires are more resilient than a single larger wire. OEH (9)

Alloys in Machine Tools. D. M. Gurney. *American Metal Market,* Vol. 38, Dec. 15, 1931, pages 3, 5.
Presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys,* Vol. 3, July 1932, page MA 215. DTR (9)

Reinforced Concrete Steel Water Mains. C. J. Desbaillets. *Canadian Engineer,* Vol. 62, May 3, 1932, pages 19-20.
The Bonna reinforced concrete pipe consists of a steel pipe lined inside and out with concrete and further reinforced on the outside with steel. Recent improvement in the joint has increased the usefulness of the pipe. VVK (9)

Light Metal Alloy Pistons and Rods in High-Speed Industrial Engines. B. J. Isidin. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, *Oil & Gas Power,* pages 109-115.
As a satisfactory means of reducing the weight in pistons and rods of modern high-speed internal combustion engines the use of Al is discussed which allows heavier sections and thus preserves the rigidity and removes thermal difficulties which are encountered with steel or cast Fe parts of reduced section. Diagrams showing the force and stresses at the different strokes with different materials and speed are developed showing the better behavior of Al and its alloys. See also *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 246. Ha (9)

Nickel-Chromium Cast Iron Dies. Herbert Chase. *American Machinist,* Vol. 76, Jan. 7, 1932, pages 11-14.
Cast Fe alloyed with Ni and Cr is used for stamping, pressing and forging operations. It is used in working both ferrous and non-ferrous sheet. Dies made from this cost less initially than hardened steel dies and in many cases last longer. They are fine grained, take a high polish, and largely eliminate galling of pressed parts. Dies should be heat-treated. Hardness may range from 200 to 400 Brinell. Tensile strength may run up to 50,000 lbs./in.^{2} A table is given showing 14 possible compositions and showing heat treatment for each. RHP (9)

Nitriding Steels. H. A. Defries. *American Metal Market,* Vol. 38, Dec. 12, 1931, pages 9, 10.
Presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 249. DTR (9)

Materials for Bearings. (Über Gleitlager- Werkstoffe.) E. Becker. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, June 19, 1932, page 328.
After dealing with the requirements that bearings have to meet, the most important materials are discussed: normal bronzes, lead bronzes, white metal, Pb-alkali earth metals, high graphite cast Fe, and a bronze of high porosity which is able to take up large quantities of oil, as it has been developed recently in U.S.A. GN (9)

The Commercial Use of Acid- and Corrosion-Resisting Steels. C. M. Carmichael. *Canadian Chemistry & Metallurgy,* Vol. 16, Aug. 1932, pages 218, 220, 222.
A general discussion of stainless steels. The handling of these is outlined and the need of a method of welding without additional heat treatment pointed out. Welding, shearing, punching, drilling, sawing, machining, threading and tapping are discussed. WHB (9)

Evolution of Metal Construction. Gardner W. Carr. *Paper presented before the American Society of Mechanical Engineers,* Aeronautic Division, Buffalo, June 1932, 7 pages.
The all-metal construction of airplanes is now apparently accepted as the standard; the development of this type, different designs and materials used are reviewed and the present status of construction and special alloys available are discussed. Ha (9)

Copper in Refrigeration Apparatus. (Le Cuivre dans les Appareils de Refrigeration.) A. Chaplet. *Cuivre et Laiton,* Vol. 5, June 15, 1932, pages 261-262.
Describes some French refrigerating machines where Cu parts are used extensively. Ha (9)

Steel Brake Drums are Lined with Centrifugally Cast Iron. Edward W. Beach & Edwin Bremer. *Steel,* Vol. 90, Mar. 14, 1932, pages 31-34.
A description of a new and improved type of brake drum for automobiles. This consists of a pressed steel drum with a lining of cast Fe in intimate combination with the steel. In manufacturing these drums, a double-width steel band is heated to a predetermined temperature, accurately placed in a specially designed high-speed centrifugal casting machine, and spun at a high speed while molten metal is introduced at the proper temperature to ensure actual fusing of the 2 metals. The drum is then cut along the mid-line by a special machine to produce 2 duplicate brake drum rings. The individual machinery developed for fast and accurate production and the process of manufacture are described. JN (9)

The Merits of Steel Pipe for Water Mains. John L. W. Birkinbine. *Journal American Water Works Association,* Vol. 24, Mar. 1932, pages 345-356; Discussion, Apr. 1932, pages 575-577.
The merits of steel pipes for water mains are discussed from the standpoint of reliability, i.e. the possibility of failure by (1) fracture, (2) exterior corrosion, (3) interior corrosion and (4) electrolysis; efficiency, i.e. the probable life, the carrying capacity of a pipe line, the changes in delivery following years of use and the losses through joints by leakage; adaptability, i.e. variations in the composition of steel to meet certain conditions, differing requirements demanded by installation of mains, the methods of joining lengths, specials and tapping for service connections; and economy, a discussion of cost figures. VVK (9)

The Use of Zinc and Zinc Alloys in the Automotive Industry. Robert M. Curts. *S. A. E. Transactions,* Vol. 26, 1931, pages 608-619, 641.
See *Metals & Alloys,* Vol. 2, Sept. 1931, page 176. (9)

Cast Iron Pipe for Transmission and Distribution of Water Supplies. Philip Burgess. *Journal American Water Works Association,* Vol. 24, Mar. 1932, pages 357-368.
The use of cast Fe pipe for water mains is discussed from the standpoint of cost, relative carrying capacity, corrosion, the ability of the pipe line to withstand interior pressures or to withstand the forces induced through outside agencies such as back-filling and traffic loads, other physical properties, and pipe connections. VVK (9)

Stainless Steel. M. J. R. Morris. *American Metal Market,* Vol. 38, Dec. 5, 1931, pages 7, 9.
Presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys,* Vol. 3, July 1932, page MA 215. DTR (9)

1 **Illinois Mine Tests Establish Advantages of Tipping Bits with Abrasion-Resisting Alloy.** A. F. Brosky. *Coal Age,* Vol. 37, July 1932, pages 259-260.
Cutting-machine bits are tipped with Blackor, a tungsten carbide compound having an excess of carbon which serves as a reducing agent in subsequent metallurgical operations. The material is applied by electric welding and followed by heat-treatment in electric muffle furnace. Operating statistics show conclusively the value of using the hard abrasion resisting material for the machine bits. CBJ (9)

Economies Through New Types and New Uses of Materials. R. E. Hobart. *Mining Congress Journal,* Vol. 18, July 1932, page 39.
2 Discussion of economics resulting through use of Cr steel, bronze, Monel metal, etc. as substitutes for different steel parts in the preparation of anthracite coal. DTR (9)

A Modern Metal Merges With the Classical. R. T. McCartney. *Metalcraft,* Vol. 8, Mar. 1932, pages 114-116, 133.
Al is used in the St. Clair Savings & Trust Co. building, Pittsburgh, Pa. to harmonize with the white marble used in the interior. VVK (9)

Developments in Aluminum Alloys in Relation to Economics in Aircraft Construction. C. F. Nagel, Jr. & G. O. Hoglund. *Paper presented before the American Society of Mechanical*
3 *Engineers,* Buffalo, June 1932, 6 pages.
The mechanical properties and corrosion resistance of available Al alloy structural materials are reviewed and the status of technical information and fabricating situation, equipment, methods of forming, jointing and corrosion prevention are discussed. Comparative data are given for riveted and spot welded joints of Alclad 17ST material which shows almost throughout the superiority of the welding process. Corrosion is prevented mainly by an anodic treatment and painting afterwards. Improved materials will make possible construction of more efficient aircraft. Ha (9)

4 **Metallization of Wood Opens New Uses.** M. Naphtali. *Chemical & Metallurgical Engineering,* Vol. 39, May 1932, page 269.
Impregnating wood with Pb, Sn, or their alloys increases its specific gravity, with little effect on tensile strength but with an increase in hardness and compression strength. This material shows up to special advantage in exposure to moisture or to fire. PRK (9)

Modern Materials for Dye-House Equipment. J. F. Springer. *Textile Colorist,* Vol. 53, Sept. 1931, pages 617-620.
5 Deals with the use of Ni and Ni-bearing alloys, particularly the super-stainless 18-8 Cr-Ni steel, pure Ni and Monel metal in dye-house equipment. Table shows comparative resistances to corrosion of ordinary C steel, stainless steel (13% Cr), and the super-stainless steel (18% Cr, 8% Ni) in a long series of reagents. (9)

Steel Used in Making Die Blocks. Bernard Thomas. *Heat Treating & Forging,* Vol. 18, June 1932, pages 353-356.
Discusses various types of die steels and their suitability for various classes of work from the point of view of unit production costs. For dies subject to intense pressures over the whole of the impression in the cold, highest grade of
6 steel marketed as "Cold-Die," which has a fair percentage of Co, is justified. For deep-drawing dies, bulk of die may be made of plain-C steel and working edges where wear takes place built-up with Co-W, Co-W-Cr alloys. Most economic steel for forming and setting dies used in manufacture of plantation hoes is plain-C steel containing 0.60% C and 0.60-0.80% Mn used in the as-forged condition. Hot dies such as those used in nut, bolt and rivet production are made preferably of W-Cr, Cr or Ni steels. If plain-C steels must be used, best procedure is to oil quench a 0.60-0.65% C steel and temper at 1000° F. for a length of time. Nitrided
7 dies give splendid results in both hot and cold work for shallow impressions and where heavy blows are not struck. Steel for forging and stamping dies is to some extent regulated by the weight of the die. For small forgings, where die-blocks do not weigh more than 250 lb., a plain 0.60% C steel will probably be best for simple shapes, 1% Ni steel for more intricate designs, and Ni-Cr-Mo steel where die is both intricate and quantity for forging large in number. For large and heavy forgings, Ni-Cr or Ni-Cr-Mo steels are suitable. In England, probably 50% of the die steel used is plain C, 30% contains 1% Ni, and remainder of higher alloys of various types. American industries probably used 20%
8 plain C, 30% Ni and Ni-Cr, 30% Cr-Mo and Ni-Cr-Mo and remainder various other high alloy types. MS (9)

New Product Broadens Field for Malleable Castings. Enrique Touceda. *Steel,* Vol. 90, Feb. 8, 1932, page 36.
This product differs from ordinary malleable Fe in that its fracture is steely instead of black and its structure shows the nodules of temper carbon uniformly distributed in a matrix of pearlite instead of the softer ferrite. Interest in the malleable Fe industry is shown by a 100-page symposium on malleable iron put out by the American Society
9 for Testing Materials. Articles now made of malleable Fe include side stakes for gondola cars, bridge guard rails, guard rail posts and blast plates. JN (9)

Development of the Specifications on Strength of Airplanes. (Entwicklung der Festigkeitsvorschriften für Flugzeuge.) H. G. Küssner & K. Thalau. *Zeitschrift für Flugtechnik und Motorluftschiffahrt,* Vol. 23, June 14, 1932, pages 313-318.
This is an abstract of report No. 278 of the Deutsche Versuchsanstalt für Luftfahrt. The historical development of the specifications on strength in airplanes is considered for the various countries. The safety factor is criticized. It seems advisable to replace the safety factor by considera-
10 tions on probability. Due to the rapid development in airplane design the specifications frequently are out-of-date. It is necessary to study the physical occurrences more extensively, in order to calculate the strength more in accordance with actual conditions. Some clues for this undertaking are pointed out. GN (9)

Recent Trends in Alloy Steels. RICHARD TULL. *Blast Furnace & Steel Plant,* Vol. 20, May 1932, pages 422-424; *Heat Treating & Forging,* Vol. 18, May 1932, pages 309-310.

Despite the decreased demand for Fe and steel products, there have been many developments in the field of alloy steels. Advances in uses of 18-8 Cr-Ni steel have been made in the food industry and construction of all metal aeroplanes and rubber-tired trolley-cars. Another development is the series of 18-8 Cr-Mn steels containing 17-19% Cr, 5-10% Mn, and small percentages of Cu or Cu and Ni. They have a silvery finish, are resistant to corrosion and oxidation and are readily worked. They exhibit great toughness at 1375°-1650° F., even after extended exposure. Much study is being given to a steel containing 4-6% Cr for applications where nominal cost and a fair degree of corrosion resistance are desired. Tests have indicated that this type has many times the life of plain C steel when subjected to moderate corrosive conditions. Concrete-reinforcing rods of this steel have been used in a dam at Alloy, W. Va., with satisfactory results. Open-hearth steel containing 3% Cr has been found particularly well adapted for use as railroad rails. Its hardness is about 375 Brinell. A steel containing substantial amounts of Cr and V has been developed for nitriding purposes. The "Cromansil" steels are attracting considerable attention among engineering steels. Recent investigations have shown that high Cr steels are far superior to plain C steel for high temperature and pressure work, and that the austenitic Cr-Ni steels are superior to the straight Cr steels. A Ni-Mo-Fe alloy has been introduced for resisting HCl. MS (9)

Municipal Building Metalized. ROLAND LINDER. *Metalcraft,* Vol. 8, June 1932, pages 227-230.

The use of bronze, cast Fe, etc. in the City and County Building, Denver, Colo. The largest bronze doors ever cast in this country weighing 10,000 lbs. each, 26 ft. high, 6 in. thick and 6 ft. 6 in. wide were installed in this building. VVK (9)

Concerning Data, Material, Conditions, Devices and Methods of Procedure Relative to Establishing Standardization in Dental Inlay Castings. C. S. VAN HORN. *Dental Cosmos,* Vol. 74, May 1932, pages 474-487.

The author praises the early work by Taggart, 1907, and by Price, 1911. As early as 1910 a compensation casting technique based upon tooth cavity temperature, available wax, and investment expansion, coordinated with gold shrinkage was developed. He reports cavity temperature ranging from 95° to 98° F., and the shrinkage of the gold in casting about 1.25%. This shrinkage can be compensated by expanding the wax pattern or by casting in an expanded investment mold. Some of the researches at the National Bureau of Standards are criticized. Two new types of casting machines developed by the author are described and a plan for further research is proposed. OEH (9)

High Pressure and High Capacity Steam Boilers, with Appendix Boiler Corrosions. (Hochdruck- und Hochleistungsdampfkessel, mit Anhang Kesselkorrosionen.) LOSCHGE. *Zeitschrift des bayerischen Revisionsvereins,* Vol. 36, May 15, 1932, pages 103-107; May 31, 1932, pages 117-119; June 15, 1932, pages 128-130.

After dealing in the first 2 instalments of the paper with the special requirements as to the construction of high pressure and high capacity boilers and describing the latest development in this field (Atmos, Benson, Schmidt, Löffler boiler) 2 remarkable instances of corrosions on high pressure and high capacity boilers are considered in the 3rd instalment. The remedies are discussed to avoid such corrosions. 15 references. GN (9)

A Great Pictorial Screen in Bronze—Its Glory is Color. GEO. B. MELCHER. *Metalcraft,* Vol. 8, Mar. 1932, pages 117-119.

A description of the very comprehensive and beautiful bronze panels in the chapel of the St. Paul's Cathedral of St. Paul, Minn. VVK (9)

The Nickel Industry in 1931. ROBERT C. STANLEY. *American Metal Market,* Vol. 38, Dec. 31, 1931, pages 3, 7, 10.

Summary of uses of Ni in industry. DTR (9)

A Welded Railroad Station. (Eine geschweisste Bahnsteighalle.) E. TEICHMANN. *Stahlbau,* Supplement to *Bautechnik,* Vol. 10, Apr. 1, 1932, pages 52-54.

Detailed description of the welding work. GN (9)

The Position of Palladium in the Precious Metal Industry. (Die Stellung des Palladiums in der Edelmetallindustrie.) E. R. THEWS & R. W. HARBISON. *Deutsche Goldschmiedezeitung,* Vol. 35, June 4, 1932, page 232.

The hardening and embrittling effect of Au on Pt can be counteracted by Pd. The uses of Pd in the precious metal industry are enumerated. In the first place it is used for processing white Au alloys. White Au alloys which are to be improved by hardening should contain at least 7% Cu. Such white Au alloys are heated to 450° C., gradually cooled in the furnace to 250° C. and then quenched in cold water. Pd- white Au alloys which cannot be improved contain up to 30% Pt + Pd and up to 95% Pt + Pd + Au. GN (9)

Helical Springs. Materials Used, Their Composition and Mechanical Properties. Manufacturing Methods. Permissible Motion and Causes of Rupture. (Le molle helicoidali. Materiali adoperati, loro composizione e loro caratteristiche meccaniche. Metodi di fabbricazione. Sollecitazione amissibili e cause di rottura.) I. MUSATTI & G. CALBIANI. *La Metallurgia Italiana,* Vol. 24, June 1932, pages 465-484; July 1932, pages 549-572.

A résumé of the manufacturing methods and types of steel recommended. Microphotographs of various typical defects which may cause failure are shown. Flexing and torsion tests are also made and charts illustrate the results obtained. The time and temperature of springs is extremely important, as 50° difference is often enough to give poorest, instead of optimum results. In chemical composition, eutectic steels (C 0.9%) seem to give the best results. They should be low in Mn (0.3-0.5%) and contain a minimum of S or P. Higher C contents may also be used. The structure should be uniform, and free of any occlusions. A study of the properties of several representative spring steels show that the tensile and torsional strength tests give the best indication of quality. AWC (9)

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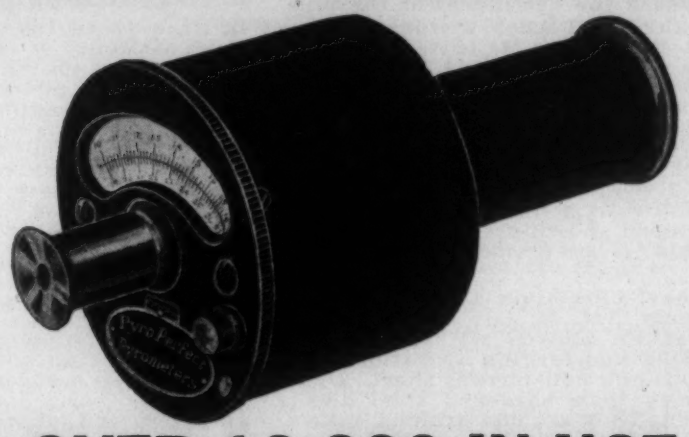

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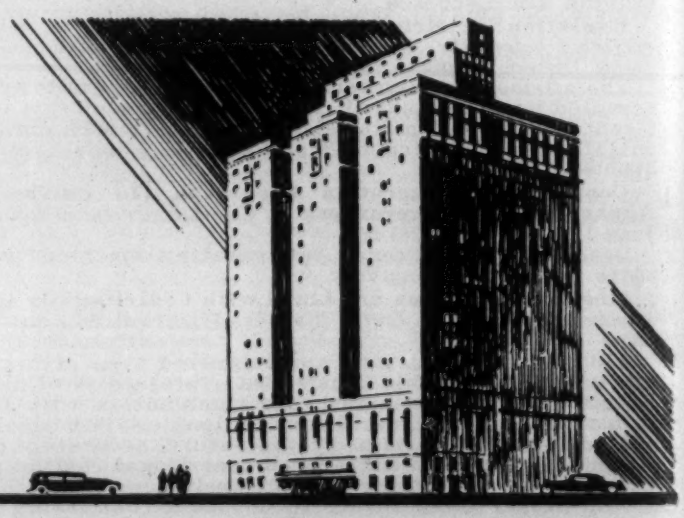

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HEAT TREATMENT (10)

Case Hardening & Nitrogen Hardening (10c)

Surface Hardening of Steel. (Durcissement Superficiel de l'Acier.) J. Galibourg. *L'Usine,* Vol. 41, May 27, 1932, pages 25-27.

The methods of creating a surface hardness by Cr plating, Ni plating, nitriding and the measurement of the hardness are briefly explained. The mechanism of nitriding hardening and the improvement by adding Al are described. Ha (10c)

Shortening the Nitriding Process. John J. Egan. *Iron Age,* Vol. 129, Feb. 4, 1932, pages 344-346.

Includes discussion. Abstract of paper read before the Metal Congress. Describes improvements made in methods which consist in use of inert materials as packing in usual ammonia treatment and in use of special molten salt bath. The work was carried out on 2 types of steels: Nitralloy 630 and Nitralloy 125. The analyses of the steels are:

	Nitralloy 630	Nitralloy 125
Carbon	0.25%	0.26%
Chromium	1.69	1.69
Vanadium	0.63	Nil
Aluminum	Nil	0.91
Molybdenum	Nil	0.10

The process particularly recommended by the author is one in which a mixture of ammonia and nitric oxide are used. VSP (10c)

An Appraisal of Nitriding. Marcus A. Grossmann. *Year Book of the American Iron & Steel Institute,* 1931, pages 106-122.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 264. (10c)

Modern Case Hardening, a Yardstick for Steel Treating. (Neuzeitliche Einsatzhärtung, ein Wertmesser der Stahlverarbeitung.) A. Herz. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, June 12, 1932, pages 316-318.

The paper discusses the various methods of surface treatment of steel from the standpoint of attaining highest quality. For the quality of a case carburizing mixture, its capacity to give off sufficient amounts of CO within short time is of prime importance. The depth of case is essentially affected by time and temperature of carburizing, less by the quality of the mixture. The elimination of excessive Fe_3C by the double hardening process is considered. The relations between depth of case and depth of hardness are stated. The carburizing of small articles by special rapid compounds, oil and gas fired modern case carburizing furnaces are discussed. The principles of nitriding are dealt with. GN (10c)

Case-Hardening of Steel in Molten Sodium Cyanide. H. N. Beilby & W. Nelson. *Journal Society of Chemical Industry,* Vol. 51, May 13, 1932, pages 149-159T.

A very comprehensive article. The following topics are discussed: the Fe-C equilibrium diagram as related to case-hardening, history and theory of case-hardening, cyanide hardening, composition of bath, deterioration and maintenance of the cyanide bath, condition of case, distribution of C, heat-treatment, control of temperature, scale and decarburization, prevention of distortion, rate of heating and quenching. VVK (10c)

Aging (10f)

The Precipitation Hardening of Iron. (Ein Beitrag zur Frage der Ausscheidungshärtung des Eisens.) W. Eilender & R. Wasmuht. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 6 pages.

It had been found that the hardness of Fe is greatly increased, similarly to duralumin, if it is quenched below the A_1 temperature and subsequently stored at room temperature; this phenomenon is called precipitation hardening as the name "refining" as used for duralumin means an actual improvement in mechanical properties while in the case of Fe a decrease of notch-toughness, elongation and reduction of area takes place. The precipitation hardening is ascribed to some substance of highly dispersed segregation in the molten metal and takes place if the solubility of this substance decreases with falling temperature, as the amount absorbed at higher temperatures is retained in quenching; that is, the alloy must be able to undercool and if the substance precipitates in storing at room temperature in an amount equivalent to the equilibrium. On the basis of the binary diagrams it was expected that O and N can have this effect. Tests showed that with increasing O only a weak increase of the precipitation hardening is observed except at a critical amount of 0.06%. On the other hand, N causes a very decided increase of the precipitation hardening at contents above 0.015%. Ha (10f)

Precipitation Hardening of Silicon-Nickel Alloys. (Ausscheidungshärtung bei Silizium-Nickel-Legierungen.) O. Dahl & N. Schwartz. *Metallwirtschaft,* Vol. 11, May 13, 1932, pages 277-279.

5 references. Alloys of Ni and Si were chill cast, heated to 950° C. for 4 hours and half the test bars were furnace cooled, the other half quenched in water. The best bars were then reheated to temperatures up to 900° C. and hardness and electrical resistance measurements were made.

Alloy	Brinell Hardness in kg./mm.² After annealing at 950° C. and quenching	Maximum hardness after reheating	Increase %
95.4% Ni, 4.6% Si	141	152	8
94.4% Ni, 5.6% Si	139	284	104
93.4% Ni, 6.6% Si	160	383	139
92.4% Ni, 7.6% Si	208	392	88
91.4% Ni, 8.6% Si	300	417	39

The maximum hardness, which is obtained by reheating to 600° to 650° C., is practically independent of the rate of cooling after annealing. The electrical resistance first increases, reaching a maximum at about 500°, then a minimum at 650°-700° C., then increasing again. This is similar to the action of duralumin. The precipitation hardening progresses very slowly. Similar results were obtained with alloys of 75% Ni and 25% Fe with Si additions. Some corrections are suggested for the constitutional diagram of Ni and Si according to Guertler and Tammann. CEM (10f)

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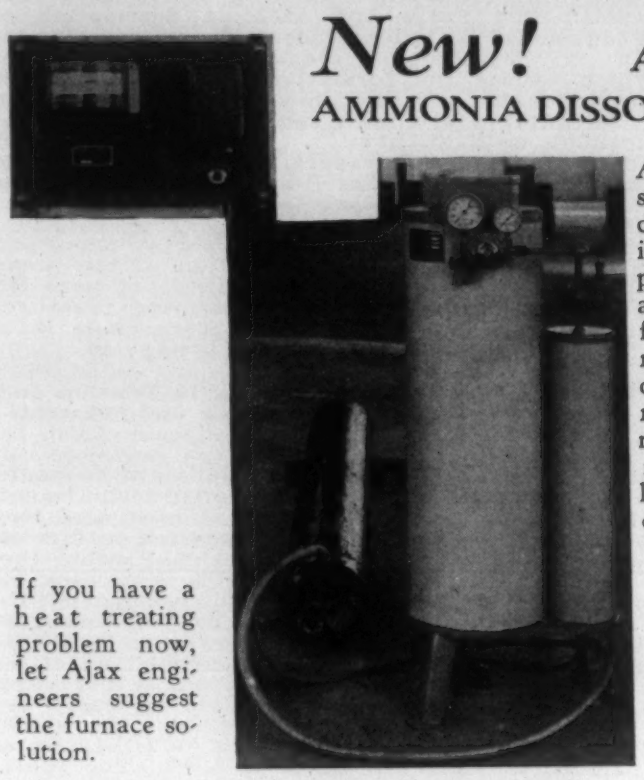

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Welding & Cutting (11c)

American Rules on Fusion Welding of Boilers and Pressure Vessels. (Amerikanische Vorschriften für Schmelzschweissung an Dampfkesseln und Druckgefässen.) F. W. Rüdel. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Apr. 1932, pages 99-103.

Survey and discussion of the most important rules of the new A.S.M.E. boiler code on fusion welding on steam boilers and unfired pressure vessels. Mechanical testing, radiography, supervision of welders, rules on annealing, water pressure tests. 8 references. GN (11c)

Welding Experiments. (Schweisstechnische Versuche.) Franz Krynes. *Zeitschrift des Österreichischen Ingenieur-und Architektenvereins,* Vol. 84, July 29, 1932, pages 157-158.

Résumé of papers before the Society of Mechanical Engineers at Vienna: F. Regler: Spannungen in technischen Werkstücken und ihr röntgenographischer Nachweis. F. Leitner: Schweissen von rost- säure- und hitzebeständigen Stählen. GN (11c)

Treatise on the Entire Field of Welding Technique. (Darstellung der Gesamten Schweisstechnik.) P. Bardtke. VDI Verlag, Berlin, 1931. Cloth, 6x8 inches, 275 pages. Price 12.50 RM.

The second edition of this volume on the entire field of welding technique (including cutting) treats in a concise, lucid manner all the different methods now employed in fusion-, pressure- and aluminothermic welding. Each method is explained in its principles and well illustrated by diagrammatic figures showing wrong and correct procedure and giving a full description of the required apparatus. Steel and iron take up, of course, the greater part of the book, but the other industrially important metals are just as fully treated. The metallurgical conditions, the equilibrium diagram and chemical reactions are discussed insofar as is required for the proper understanding of the welding mechanism. A very good chapter deals with the economics of welding compared with riveting and with the calculation of the various items making up the total cost. The testing methods, destructive and non-destructive, are aptly treated, and the X-ray technique justly given the place it has won in present-day practice. But as the book is published as late as 1931 one could have expected to see also mentioned the testing with gamma-rays, that is by radium or radioactive materials, which has certain pronounced advantages over the X-ray method as recent publications on the subject have pointed out. This minor omission, however, does not detract from the value of the book, which is rather enhanced by a valuable contribution on the safety measures to be observed in welding. Although written mainly from and for the German standpoint the practice of other countries, especially of the U. S. A., is not neglected and makes it valuable also for readers of this country.

M. Hartenheim (11c) -B-

Welded Metal Construction in Civil and Industrial Construction. (Sull' impiego delle strutture metalliche saldate nelle costruzione civile e industriale.) G. Accati. *La Metallurgia Italiana,* Vol. 24, July 1932, pages 573-579.

The advantages of welding in steel construction are discussed. AWC (11c)

A New Process for Making Welded Joints. H. S. George. *Journal American Welding Society,* Vol. 11, July 1932, pages 22-28.

Paper presented at the Annual Meeting of the American Welding Society, New York, Apr. 1932. A description of the recently developed welding process known as "Lindeweld," an oxyacetylene process using an excess of acetylene which causes the formation of a carbonaceous film as a flux to enable the filler metal to unite with the base metal. Advantages are high speed of welding, economy and excellent weld quality. TEJ (11c)

Welding of Iron under Pressure. (Ueber die Press-Schweissbarkeit des Eisens.) Hans Esser. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 8 pages.

The methods and apparatus are described which were used for the determination of the correlation of the pressure-weldability (as against fusion weldability) of pure Fe and pure Fe-C alloys with temperature, welding pressure, surface quality and grain size. The tests were made in a vacuum. See *Metals & Alloys,* Vol. 2, Apr. 1931, page 83. Ha (11c)

Combined Effect of Riveting and Welding in Tension and Compression. (Zusammenwirken von Nietung und Schweissung bei Zug und Druck.) G. Gaber. *Der Bauingenieur,* Vol. 13, May 20, 1932, pages 290-294.

Experiments show that riveted constructions are economically reinforced by welding. The riveted construction must be reinforced in stressed state. When in a tensile test bar under an initial stress of ½ actual load the shearing surface of the sole rivet is increased by 82% by 4 additional welds, the bearing power of the bar is increased by 67%. According to the calculation the bearing power of the welds becomes effective to 57%. At the breaking load the rivet participates only to 50% of its bearing load, the seams, however, to 100%. When in a compression test bar under an initial load of ½ actual load the shearing surface of the 4 rivets is increased by 82% by 8 side welds, the bearing power is increased by 73%. The calculation shows the bearing power of the welds to become effective to 81%. At the breaking load the rivets actually participate to 83%, the welds to 100%. The combined effect of rivet and weld, therefore, is better when several rivets are present. In suitably adjusting the welds to the rivets, riveted constructions can economically be reinforced by welding while construction is in use. GN (11c)

Welded Lattice Crane Girder. V. A. Prince. *Welder,* Vol. 3, June 1932, pages 6-19.

The particular points to be observed in the building of crane girders by welding are illustrated and treated in detail in a complete calculation of a bridge girder for a 25-ton overhead traveling crane of 72-ft. span. All construction details are given. Ha (11c)

The Endurance Strength of Fusion Welded Steel Sheets. (Die Dauerfestigkeit von autogengeschweissten Stahlblechen.) F. Pester & Hans Schulz. *Die Schmelzschweissung,* Vol. 9, June 1932, pages 130-132.

The tensile properties of steel sheets, right-hand and left-hand welded and hammered and not hammered, were investigated and compared with those of the unwelded material. In general, the values of tensile strength, elastic limit, ultimate strength and endurance bending strength are reduced; right-hand welds show a greater ultimate strength than left-hand welds. Hammering of the red-hot seam increases the endurance strength about 10% for left-hand welds and 20% for right-hand welds. The testing method is described in detail. Ha (11c)

Study of the Employment of Arc-Welding in Naval Construction: The Problem of Welded Joints. (Essai sur l'emploi de la soudure a l'arc en construction navale: le probleme des joints soudes.) J. Pinczon. *Revue Generale de l'Electricite,* Vol. 31, June 11, 1932, pages 807-814.

The value of arc-welding in the construction of vessels is discussed and the forces in the welds analyzed. According to the author it will suffice for arc-welding of the parts of a ship to determine the characteristics of a riveted assembling which would have to be used. Instead of lap-welding, butt-welding with V-shaped ends is recommended which in certain cases is the only practical method. Instead of using a discontinuous double-fillet it is better to employ in all cases a continuous fillet of half the height of the thickness of the sheet or profile. The author warns against insufficiently tested innovations, as in ship construction safety must be the first consideration. Ha (11c)

The Art of Welding—A Nontechnical Résumé. D. E. King. *Steel,* Vol. 90, Mar. 28, 1932, pages 38-39.

The author describes a series of 4 ingenious experiments with lighted candles to demonstrate the principles of various types of welds. The requirements for a good weld are cleanliness, control of applied heat, control of pressure, and control of the structure of deposited metals. JN (11c)

Effect of Phosphorus on Welding Properties of Mild Steel. Roger Powell. *Welding,* Vol. 3, Aug. 1932, pages 469-470.

In forge-welding high C to mild steel, best results are obtained when the mild steel is Bessemer stock containing .08-.12% P. TEJ (11c)

Conclusions and Results of Electric Welding. (Erkenntnisse und Erfolge bei der elektrischen Schweissung.) Willy Prox. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, May 21, 1932, pages 497-504.

The great progress made in the production of high-quality materials made necessary also a method for joining these metals; the advantages and defects of electric welding and its testing methods are briefly discussed. Ha (11c)

Electrically Welded Steel Frame Masts. (Elektrisch geschweisste Stahlgittermaste.) Klee. *Elektroschweissung,* Vol. 3, July 1932, pages 135-136.

Outline of the procedure to be followed. GN (11c)

Significance and Recognition of Initial Stresses in Welded Constructions. (Zur Frage der Bedeutung und Erkennung von Anfangsspannungen in geschweissten Konstruktionen.) O. Bierett. *Stahlbau,* Supplement to *Bautechnik,* Vol. 5, June 10, 1932, pages 94-96.

The paper discusses the relation between the changes of shape of base metal and joint in welded constructions at which the stresses in the seam, particularly the normal stresses, depend on the behavior of the base metal during welding. The possibilities of recognizing the initial stresses in the cooled seam are considered. The author shows that there has not yet been devised a method which, in order to determine the stresses, permits measuring the changes of shape during welding of the seam or at least near the seam and which sufficiently takes account of the temperature effects. The Heyn and Bauer method for stress determination is too complicated. On the basis of loading tests on welded constructions the author made observations which led him to a simple method which permits drawing conclusions upon the initial stresses in the welded construction. By plotting load-deformation curves the curves were found to show characteristic deviations from the straight line deformation to be expected. These deviations were used to determine the initial stresses. From such test conclusions it is also possible to determine the most favorable welding conditions with respect to the initial stresses. 3 references. GN (11c)

The Fusion Weldability of Austenitic Manganese Hard Steel. (Die autogene Verschweissbarkeit von austenitischen Manganhartstahl.) H. Buchholz. *Die Schmelzschweissung,* Vol. 9, June 1932, pages 122-127.

A successful welding of austenitic Mn steel is possible with observation of several factors: the excess of gas should be so that the blue gas cone in the flame is about 1-1½ times as big as the flame cone; to obtain an absolutely thorough weld a flux should be employed as protection against oxidation by air on the underside of the sheets. The burner should be for a larger size of sheet than that to be welded. The welding process for this kind of steel should be carried out fairly slowly. The right-hand (progressing) welding is superior to the left-hand (retrogressive) welding as the oxides are driven away from the fusion by the pressure of the flame gases and the weld is dense and homogeneous. X-seams should be avoided, and the process should not be interrupted. Hammering when still warm is to be avoided as cracks may occur. Ha (11c)

Welding in Steel Structural Work—British Practice. James Caldwell. *Welding Journal,* Vol. 29, June 1932, pages 166-169.

Paper read before the International Association of Bridge and Structural Engineering, Paris Congress, May, 1932. Electric arc welding of steel structures has developed into general practice. The heavy coated electrode is generally used, the light single-run fillet weld being preferred. Allowable working stresses are: Tension, 8.0 tons/in.^{2}; Compression, 6.5 tons/in.^{2}. The main factors controlling economic and consistent welded production include intelligent design, sound organization and welding procedure, thoroughly trained operators and inspectors and the employment of correct welding equipment and electrodes. Much work has been done in strengthening of steel structures by welding, though it is generally agreed that a combination of riveting and welding in the same structure is bad practice. TEJ (11c)

Sixty 8-inch Pipe Welds per Hour. Malcolm Clark. *Welding Engineer,* Vol. 17, Jan. 1932, pages 29-31.

The details of the construction of an automatic pipe welder for butt-welding 8" pipes in the field are described. The transformer can give 1200, 800 and 600 kva. at 4 different secondary voltages. The upset pressure of 1200 lbs./in.^{2} is given by 2 hydraulic cylinders and totals 188,000 lbs. The time cycle of the weld can be adjusted from 4-40 seconds. The actual welding time varies from 4½ sec. for 3½" pipe to 22 sec. for 16" pipe. Ha (11c)

Gas and Electrically Welded Tubes. (Autogen und elektrisch geschweisste Rohre.) Köster. *Gas und Wasserfach,* Vol. 75, June 11, 1932, pages 498-499.

Microscopic examinations and mechanical tests on welded pipes installed at the Berlin Water Works during the year 1931. GN (11c)

Machine Welding—Problems in Design and Operations. J. L. Anderson. *Journal American Welding Society,* Vol. 11, June 1932, pages 7-9.

Paper presented at the annual meeting of the American Welding Society in New York, Apr. 1932. Change from manual to mechanical gas welding cannot be satisfactorily made until every variable is removed or controlled. The author discusses the variables encountered, particularly weldability of steel, and warpage due to welding heat. Warpage is controlled by mechanical means as well as through the application of heat at various points other than the welding zone. TEJ (11c)

Resistance Welding in Europe. M. L. Eckman. *Welding Engineer,* Vol. 17, Jan. 1932, page 46.

Impressions of the art in Germany, England, France and Italy. A greater development of alternating current arc welding was noticed. Ha (11c)

The Application of Welding Technique in Constructing Boilers and Vessels and in Repair Work. (Die Anwendung der Schweisstechnik beim Bau von Dampfkesseln, Behältern und bei der Ausführung von Reparaturen.) F. A. Birke. *Apparatebau,* Vol. 44, Apr. 29, 1932, pages 67-72.

The article first considers the advantages which welding offers in boiler construction in comparison with riveting. It could be proven that whenever welded boilers exploded this was due to a faulty welding practice. In Germany there is not yet a uniform regulation as to the licensing of firms that are doing welding work. The paper then shows in some interesting examples to what extent it is possible today to successfully repair boilers or chemical vessels by welding. GN (11c)

The Gas and Electric-Welding of Acid-proof Steel. (Das autogene und elektrische Schweissen säurefesten Stahls.) *Die Metallbörse,* Vol. 22, Feb. 13, 1932, pages 194-195.

The writer points out the difficulties encountered in welding stainless steels, i.e. (1) volatilization of Cr and oxidation of Ni at high welding temperatures, (2) carbon absorption of stainless steels low in C, (3) low heat conductivity of the Cr steel sheets, (4) extremely large heat expansion of the sheets exceeding 50% that of ordinary steels. Data are presented with regard to electro-welding. The arc should not be too long and the welding rods should contain 19% Cr, 8.5% Ni and below 0.10% C. The advantage of gas welding, i. e. the low welding temperature is nullified by the C content of the torch, which induces C into the steel. The torch should be neutral or slightly reducing. However the C content of the seam is very likely to run up as high as 0.5-0.6% C. Neither welding method can eliminate the drawback mentioned under (3). A slight advantage is claimed by the author for the oxy-acetylene welding method. Cooling devices should be provided for. In order to prevent warping due to (4) the sheets should be clamped rigidly. The welding operation should be followed by an annealing treatment to nullify structural changes occurring during the welding performance. EF (11c)

Economies obtainable by Welding in Structural Fabrication. ALEX. L. WILSON. *Welding Engineer,* Vol. 17, Mar. 1932, pages 43-45.

The points which would recommend welding instead of riveting of structures are discussed. Welding offers 3 advantages in design: (1) in tension members no deduction need be made for holes, (2) connecting members are eliminated and (3) non-working areas are eliminated. The shop costs entering the question of possible economies are discussed; semi-automatic welding machines are recommended. Ha (11c)

Welding Standards in the Piping Industry. JOHN ZINK. *Industry & Welding,* Vol. 3, June 1932, pages 3-6, 31-32.

The practical points of welding neck flanges, van Stone flanges and slip-over flanges are discussed. Fittings should be made from seamless tubing, elbows should have a radius of 1½ times the pipe diameter under proper consideration of pressure drop, appearance, standardization, etc., and uniform and full wall thickness to line up true with the pipe or flange to which it is to be welded. The ends of all fittings should be beveled in accordance with the National Association Standards. Short tangents are not necessary but are permissible. Ha (11c)

Homemade Spot-Welding Machine. *Engineering & Mining Journal,* Vol. 133, Aug. 1932, page 421.

A photograph and a brief description are given of an automatic welding machine made for the Homestake Mining Co. The machine is applicable for welding mine ventilating pipe. The operation of spot-welding 12" galvanized Fe piping is illustrated. WHB (11c)

Use and Construction of Staybolt Welded Structures for Equipment Construction. (Anwendungen und Ausführungen von Stehbolzenschweissverbindungen in Apparatebau.) WITTMANN. *Die Chemische Fabrik,* May 11, 1932, pages 150-151.

Describes the construction of cooling and heating units and heat exchangers, making use of the double wall design and staybolt welding. CEM (11c)

Welded Fractionating Columns. *Industrial Chemist,* Vol. 8, Mar. 1932, page 118.

A brief note on the construction of 2 welded fractionating columns weighing 26 tons each. RAW (11c)

Pediatric Building for the Boston City Hospital, Shop and Field Welded. J. THEODORE WHITNEY. *Journal American Welding Society,* Vol. 11, July 1932, pages 20-22.

Details of erection, joint design, shop and field welding of a 9-story steel structure. TEJ (11c)

Factors on which the Hardness of Built-up Welds Depends. (Faktoren von denen die Härte von Auftragsschweissungen abhängt.) K. L. ZEYEN. *Die Schmelzschweissung,* Vol. 11, June 1932, pages 117-120.

Tests made with different welding wires have shown that the Brinell hardness of the seam depends greatly on the burning of alloying elements out of the welding wire as also on the manner of welding, and secondly on the cooling velocity of the weld, the welding method, thickness of the material and number of seams laid on top of each other. Besides, the chemical composition of wire and base material is very important. The hardness of the seams increases for single seams by electric arc welding with increasing thickness of the base material, but decreases by the fusion welding method. For several layers of seams the hardness is less if one seam is still warm when the next is put on. The hardness is less influenced if the welding wire contains Cr and V than if C only is contained in the wire. Ha (11c)

Oxy-Acetylene Welding and Cutting in Coal Mines. E. S. WADE. *Mining Congress Journal,* Vol. 18, July 1932, pages 37-38.

Numerous examples are cited of the uses to which oxy-acetylene welding and cutting torches can be put in coal mines. This equipment is most important means for making savings in labor and materials, and for increasing operating efficiency in every phase of mining. DTR (11c)

Quality of Welds may be Determined by Visual Inspection. FRANK B. WALKER. *Transit Journal,* Vol. 76, July 1932, pages 309-311.

Visible criteria of a good weld include the following: no drops spattered nearby, no overlap (incomplete fusion at weld edges), both edges merge smoothly into base metal, uniform bright luster, uniform size and thickness. Unsatisfactory welds can be attributed to the arc being too long or the arc being too hot or cold. Paint, scale, rust, dirt, oil prevent good welding. CBJ (11c)

Welding of Steel Structures. (Vasszerkezetelk hegesztése.) K. ROTTER. *Anyagvizsgalok Közlönye,* Nov.-Dec. 1930, pages 136-150.

Remarks on the problem of welding steel structures, which gain an always growing field of application in America as well as in Europe. The latest German regulations for welding steel structures above ground are discussed, some examples of welding in bridge buildings are shown. The questions still unsolved in this line are pointed out. GG (11c)

Course for Teaching Pipe Welding in a Trade School. C. H. BRITTON. *Welding,* Vol. 3, July 1932, pages 435-438.

As a result of 4 years' experience in teaching pipe welding, a course has been outlined which if carefully carried through by the student will result in his becoming a good welder. Outline of the course is given. TEJ (11c)

Automatic Arc Welding with the Shielded Arc. A. F. DAVIS. *Machinery,* Vol. 38, Jan. 1932, page 369.

Discussion of "Automatic Arc-Welding Applications" published in *Machinery,* Dec. 1931, page 270. Molten weld metal while being deposited has an affinity for O and N. A method of shielding the weld metal has been devised. This is said to completely shield the weld metal from the O and N, and so increase the strength of the weld and reduce the possibilities of corrosion. RHP (11c)

Arc Welding Helps Save $1,000,000 on Boston Tunnel. A. F. DAVIS. *Journal American Welding Society,* Vol. 11, June 1932, pages 15-16.

Description of tunnel under Boston Harbor, in the construction of which arc welding played an important part. The steel liner is made up of rings, 31 ft. in diameter and 2½ ft. wide, each ring containing 11 segments or panels. There are 132.72 miles of welding which was done with the shielded arc process. TEJ (11c)

On the Testing of Welded Joints by Milling or X-rays. (Über die Prüfung von Schweissverbindungen durch Anfräsen oder Röntgenstrahlen.) R. BERNHARD & A. MATTING. *Stahlbau,* Vol. 5, July 22, 1932, pages 114-116.

Experiments show that welded joints can be examined in simple cases by milling and etching. This holds true, for instance, for building constructions, when detrimental effects due to minor or no dynamic loads need not be feared. Milling may then be used as supplement to X-ray examinations. For constructions which, for reasons of safety, need careful examination, X-raying cannot be dispensed with. Due to its manifold application, X-ray equipment can be utilized economically. 7 references. GN (11c)

75 Miles of Welded Piping in New Hospital Unit. *Steel,* Vol. 90, Mar. 21, 1932, pages 34-35.

The new group of buildings for the New York Hospital —Cornell Medical Clinic in New York utilized 60,000" of acetylene gas welding in the construction of its pipe lines for heating, power, refrigeration and ventilation. This $2,000,000 welding contract required 75 miles of steel and wrought Fe pipe, ranging in diameter from 2½ to 24" and weighing a total of 750 tons. Fabrication included loops, sharp turns, curves, cross-overs, underground tunnels and sub-basement work. JN (11c)

Corrosion-Resisting Steel Milk Truck Tank Withstands Price War Bombing. *Steel,* Vol. 90, Apr. 4, 1932, page 43.

A welded corrosion-resistant steel tank loaded with 2000 gal. of milk successfully resisted rupture when a violent explosion of dynamite occurred at its rear end. The force of the explosion dented the tank, damaged the Al and cork coverings considerably, and blew off the manhole cover. JN (11c)

Difficulties in Electrically Welding Copper. (Schwierigkeiten beim elektrischen Schweissen von Kupfer.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, July 3, 1932, page 355.

Brief discussion of the detrimental effect of oxygen and porosity on the tensile properties of Cu. GN (11c)

Control of Expansion in Copper Plate Welding. *Welding Engineer,* Vol. 17, June 1932, pages 37-38, 44-45.

The method of welding big Cu vats 6 ft. 4 in. in diameter and 8 ft. 6 in. in height is described in full. (11c)

Controlling Expansion and Contraction. *Welding News,* Vol. 3, Apr.-June, 1932, pages 17-19.

The proper handling of material for the elimination of the effects of expansion and contracting during welding is discussed and practical suggestions made so that when the weld is finished and the metal has finally cooled, it will have attained its original shape internally as well as externally, and there will be no internal stresses. Ha (11c)

Recently Welded Bridges. (Neuere geschweisste Brücken.) *Schweizerische Bauzeitung,* Vol. 99, Jan. 16, 1932, pages 35-36.

Description of construction and welding of the Rhone bridge near Leuk, Switzerland, and of a bridge in the Skoda plant at Pilsen, Czecho-Slovakia. GN (11c)

Mild Steel Welds Deposited with the Electric Arc. The Role of the Coating from the Point of View of Distortions of the Crystalline Grains. (Sur les soudures en acier doux déposées à l' arc electrique. Rôle de l' enrobage au point de vue des distorsions des grains cristallins.) D. ROSENTHAL & M. MATHIEU. *Comptes Rendus,* Vol. 194, Apr. 11, 1932, pages 1244, 1245.

The authors have already shown *Comptes Rendus,* Vol. 191, 1930, page 484, by means of X-rays the existence of distorted grains in welds made with bare electrodes of mild steel. In welds which have been protected by slag, or made with coated electrodes, scarcely any such distorted grains occur. The present paper deals with results of tests which serve to confirm their previous observations. These show that the absence of distortion in welds made with coated electrodes is due to annealing of the welds *in situ.* This annealing occurs more easily when *at the same time* the coating affords protection to the weld against oxidation and nitridation. OWE (11c)

Testing of Weld Seams on the Electrically Welded Schlachthof Bridge in Dresden. (Schweissnahtprüfungen an der elektrisch geschweissten Schlachthofbrücke in Dresden.) F. REINHOLD. *Elektroschweissung,* Vol. 3, July 1932, pages 128-131.

The testing of the seams was performed according to the Schmuckler method. The milled seam was etched with a saturated solution of Cu-ammonium chloride. A special method is suggested in which the quality of the seam at every milled spot is characterized by a quality number. For every welder there is obtained a series of quality numbers from which the mean quality number and the degree of uniformity of the performance of every welder is to be determined. A better judgment and supervision of the work of every welder is thus achieved. The latter procedure is to be replaced by continuous mechanical tests of the seams after the relation between quality number and tensile strength of the seam has been established. GN (11c)

Application of the "Schlierenmethod" for the Examination of Cutting Nozzles. (Anwendung des Schlierenverfahrens zur Untersuchung von Schneiddüsen.) MAIER. *Autogene Metallbearbeitung,* Vol. 25, June 1, 1932, pages 170-171.

The "Schlieren" method is an optical method for the examination of gases which escape from a nozzle under high pressure and has the advantage that the gas jet is not disturbed by the insertion of measuring instruments. The principle of the method is that the escaping jet is illuminated by a pointed light source and makes visible optical differences of density between the gas and the surrounding atmosphere. The picture of the gas jet is projected to a screen. At a certain pressure stationary waves are formed in the jet and from the picture the influence of the shape of the nozzle can be determined. A few photographs illustrate the method. Ha (11c)

Resistance Welding in the Dodge Automobile Plant. JAMES J. MURRAY. *Welding,* Vol. 3, July 1932, pages 411-413.

Description of flash, projection and arc welding operations in an automobile plant. TEJ (11c)

Developments in Fusion Welding. T. S. MURPHY, JR. *Welding Engineer,* Vol. 17, May 1932, pages 33-36; June 1932, pages 41-43.

The particular suitability of fusion welding in the manufacture of pressure vessels is pointed out; the improvements in the processes and testing methods are described. Ha(11c)

Electric Arc Welding Instead of Water Gas Welding. (Lichtbogenschweissung statt Wassergasschweissung.) C. MASSMANN. *Elektroschweissung,* Vol. 3, May 1932, pages 96-98.

Up to the present time boilers, high pressure vessels and similar apparatus are still water gas welded in general. More recent experience, however, shows that such apparatus which have to meet highest requirements can successfully be welded electrically, provided suitable electrodes are applied. Despite the high expenses for electrodes electric welding is 40-60% cheaper than water gas welding. The paper summarizes the results of mechanical tests on welded plates (plate thickness : 15 mm, weld : V-shaped with an angle of 60°). The results of tensile tests, bending tests, bending tests after quenching, notch toughness tests and aging tests proved the welds of highest quality. On the base of these results the author suggests that electrically welded joints should be admitted with a calculation factor of 0.9 as it is used for water gas welded joints. Testing, naturally, is to be performed along the same principles as used for testing water gas welded apparatus. GN (11c)

Continuous Manufacture of Welded Conduit. J. B. NEALEY. *Steel,* Vol. 90, Feb. 8, 1932, pages 31-33.

A description of the continuous process in use by the Fretz-Moon Tube Co. of Butler, Pa., for the continuous production of steel conduit from coiled skelp. JN (11c)

Bending Tests on Welds. (Über Biegeversuche mit Schweissungen). O. MIES. *Elektroschweissung,* Vol. 2, Sept. 1931, pages 170-176.

The significance of the testing values obtained in bending tests, as angle of bending, Tetmajer bending value and the elongation of bending, on non-welded and welded sections are considered. The difference between the capacity of deformation of the welded joint and the base metal is pointed out. The angle of bending as determined by the transverse bending test is indicative of the transverse bending capacity of the joint but not indicative of the capacity of deformation of the joint, including the base metal. The capacity of deformation of the joint is better determined by longitudinal bending tests which simultaneously characterize the longitudinal bending capacity of the joint. The question is raised whether or not the determination of the longitudinal bending capacity is of the same importance as the transverse bending capacity which is generally determined. It is pointed out that both of these tests bring about no new knowledge on the properties of the weld in comparison with the longitudinal and the transverse pulling test. GN (11c)

Welding Non-Magnetic Steel Alloys. PAUL ORR. *Machinery,* Vol. 38, Mar. 1932, pages 489-491.

Tops of oil circuit breaker tanks are made of non-magnetic metal. These have the following composition: C, 0.25 to 0.40 %; Mn, 6 to 8%; and Ni, 10 to 12%. The strength and physical characteristics of this is similar to and slightly better than mild steel. Describes the welding procedure in considerable detail. RHP (11c)

Qualifying the Welding Wire. G. W. PLINKE. *Welding Engineer,* Vol. 17, Mar. 1932, pages 27-31.

The qualities of welding wires are discussed and the mechanical properties of a few types for welding mild steels and ferrous and non-ferrous alloys described. The advantage of exclusion of harmful atmospheric contamination in welding is explained and its elimination by producing a protective atmosphere in oxy-acetylene welding and the atomic hydrogen process described. Ha (11c)

Arc Welding Hazards—Their Cause, Effect and Prevention. F. S. PEASLEY. *Welding,* Vol. 3, July 1932, pages 418-421.

Common hazards peculiar to arc welding are (1) Use of improper goggles, garments, shields or devices for protecting the operator and other workmen, (2) Insufficient or no ventilation of booths or rooms to exhaust smoke, fumes and gases, (3) Failure to indicate or mark hot metal or stock, (4) Insufficient training and instruction of operators in the technique of welding and use of precautionary measures and protective devices. TEJ (11c)

On the Stress Distribution in Front Butt Weld Seams. (Über die Spannungsverteilung in Stirnkehlnähten.) OTTO MIES. *Elektroschweissung,* Vol. 3, Aug. 1932, pages 141-147.

The stress distribution in front seams is treated, taking into consideration the conditions of equilibrium and deformation. From the testing results it is concluded that an approx. linear stress distribution can be assumed for the cross-sections through the corner of the seam. The stresses in the corner are higher by a certain amount than the mean stress. Taking into consideration the stress distribution and the amount of the molten welding material the most favorable form of the seam is calculated. 3 references. GN (11c)

Electrical Double-Spot Welding. (Die elektrische Doppelpunktschweissung.) K. RUPPIN. *Elektrowärme,* Vol. 2, June 1, 1932, pages 137-138.

This new process consists in the following: If a thin sheet is to be welded to a thicker one the 2 electrodes are used to make contact at first with the thin sheet and heat up and soften it so that the pressure between the 2 pieces brings them into intimate contact; the current flows now also through the thick sheet and the actual welding is done. This method has the advantage over the usual process where the contact is made in a single spot as the electrodes are connected each to one sheet instead of both to the same sheet, so that the size of the pieces welded together is irrelevant, and even not fully cleaned surfaces can be welded as the heat developed in the one sheet first burns the dirt, grease, etc. and cleans the spot to be welded. It is further claimed that it is more time saving as 2 points are welded simultaneously where formerly only one was finished. It is more convenient to handle and can be moved more easily. The process is particularly useful in the making of automobile bodies, locomotive construction, metal furniture, etc. Ha (11c)

Oxyacetylene Welding in Production. H. O. T. RIDLON. *Journal American Welding Society,* Vol. 11, July 1932, pages 18-20.

Abstract of paper presented at March 4th 1932 Meeting of Chicago Section of American Welding Society. The 3 principal factors in connection with production welding and cutting are (1) proper use of equipment, (2) production methods and use of jigs, (3) the operator or the human element. TEJ (11c)

"Shot Welding" Stainless Steel in Aircraft Construction. E. J. W. RAGSDALE. *Welding,* Vol. 3, Aug. 1932, pages 471-473.

Paper read before the American Society of Mechanical Engineers at Buffalo, New York. A discussion of the uses of stainless steel of the 18 and 8 type in aircraft construction with particular reference to welding this material. Shot welding is a spot welding operation done at high currents and short time of current dwell. It is the only known method of welding 18 and 8 without causing carbide precipitation. TEJ (11c)

Further Development of the Arcatom Welding Method. (Welterentwicklung des Arcatom-Schweissverfahrens.) S. SANDELOWSKY. *A E G-Mitteilungen,* Mar. 1932, pages 112-114.

Recent improvements in regard to operation, application and service with some results are described. Ha (11c)

On Stresses in Welded Wheel Tires. (Über Spannungen in auftraggeschweissten Bandagenradsätzen.) S. SANDELOWSKY. *Elektroschweissung,* Vol. 3, July 1932, pages 121-127.

The paper first discusses origin and size of thermal stresses set up by temperature changes for the simple case of a bar. The temperature course in welded wheel tires was studied. (Wheel: open hearth steel, rim: cast steel, welding speed 10 m/hr.). On welding the temperature increases expotentially and reaches a maximum after half of the total welding time. The hub is heated up more slowly. The shrinkage and welding stresses were determined separately. The welding stresses decrease with increasing C content. Welding rods with .8-1.0% C should be used, so that the C content of the seam amounts to at least .5%. For equal chemical composition of the seam the temperatures of seam and base metal chiefly affect the originating stresses. The wheel set should be welded as hot as possible, but at temperatures above 180° C. of the parts to be welded together the weld obtained is not reliable. Under normal conditions the welding stresses amount to from 28,500-56,900 lbs./in². The total stresses set up varied between 62,600-132,300 lbs./in². 4 references. GN (11c)

Welding in the Assembly Plant. (Schweissen im Fertigungsbetrieb.) SCHAUBERT. *Maschinenbau,* Vol. 11, Jan. 7, 1932, pages 17-18.

Paper read before the Arbeitsgemeinschaft deutscher Betriebsingenieure, Cologne, 1931. A comprehensive account of the latest progress in welding as seen from the designers' and mechanics' viewpoint. RV (11c)

Arc-Welding in Metal-Carpentering. (La Soudure a l'Arc dans la Menniserie Metallique.) R. SARAZIN. *L'Usine,* Vol. 41, Apr. 29, 1932, pages 31-35.

Describes and illustrates methods used for joining small metallic parts, as window sills, sashes, ornaments, etc. which have to be built up from structural shapes. Ha (11c)

Riveting (11d)

Gasholder and Tank Riveted Joints. S. M. MILBOURNE. *Gas Journal,* Vol. 198, May 25, 1932, pages 436-438.

Describes a graphical method of analysis which facilitates the design of most forms of riveted joints and enables the efficiency to be readily estimated without tedious calculation. MAB (11d)

Rivet Manufacture Keeps Step with Progress in Fabricating Methods. PIERRE CHAMPION. *Steel.* Vol. 90, Feb. 8, 1932, page 35.

The demands of higher strength steels have been met by the development of rivets having higher strengths and better physical properties. A recent development is a special processed hot-formed rivet made of forging steel for boiler construction. The use of cold pressed, annealed rivets is increasing with the use of electric rivet heaters. Stainless steel rivets have been introduced for use in ship bottoms. JN (11d)

Tests with Riveted Joints under often Repeated Load. (Versuche mit Nietverbindungen bei oftmals widerholter Belastung.) OTTO GRAF. *Zeitschrift Verein Deutscher Ingenieure,* Vol. 76, Apr. 30, 1932, pages 438-442.

A series of tests was made to find out if there is any advantage in using the modern special building steels compared with ordinary steel when they are subjected to greatly varying, often repeated stresses. In dimensioning of rivets and rivet joints special precaution must be taken in obtaining as high as possible a gliding resistance; deformations or dislocations even under low loads are permanent, and subject the rivets to stresses which can not be equalized by spring action of the metal. The rather complicated conditions are shown in photographs and curves. Ha (11d)

WORKING OF METALS & ALLOYS (12)

Melting & Refining (12a)

Metallic Charge in Basic Open-Hearth Operations. CLARENCE D. KING. *Blast Furnace & Steel Plant,* Vol. 19, Nov. 1931, pages 1451-1454; Dec. 1931, pages 1577-1580; *Engineering,* Vol. 133, Feb. 19, 1932, page 235.
See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 275.
MS+LFM (12a)

The Bessemer Process and Its Product. RICHARD S. MCCAFFERY. *Engineering,* Vol. 133, Feb. 19, 1932, page 235.
Abstract of paper read before the American Iron & Steel Institute, New York, October 23, 1931. See *Metals & Alloys,* Vol. 3, June 1932, page MA 178. LFM (12a)

Fabrication of the Platinum Metals. C. S. SIVIL. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 246-261.
Includes discussion. See *Metals & Alloys,* Vol. 2, May 1931, page 105. (12a)

Debismuthizing Lead with Calcium. RALPH F. COHN. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 107-113.
Includes discussion. See *Metals & Alloys,* Vol. 2, May 1931, page 105. (12a)

Change of Composition of Steel in a Basic Lined Ladle. Melts made in a Basic Lined Furnace. (Ueber die Aenderung der Zusammensetzung des auf basischem Futter erschmolzenen Stahles in der Giesspfanne.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 15, 1932, pages 199-200.
Review of a paper by Bardenheuer & A. Ranfft in *Mitteilungen Kaiser Wilhelm Institut für Eisenforschung,* Vol. 13, 1931, pages 291-305. See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 275. GN (12a)

Steel Making in Coreless Induction Furnaces. *Metallurgist,* Jan. 1932, pages 7-9.
Extended abstract of Report No. 207 of the Stahlwerksausschusses of the Verein deutscher Eisenhüttenleute by F. Pölzguter. See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 18. VVK (12a)

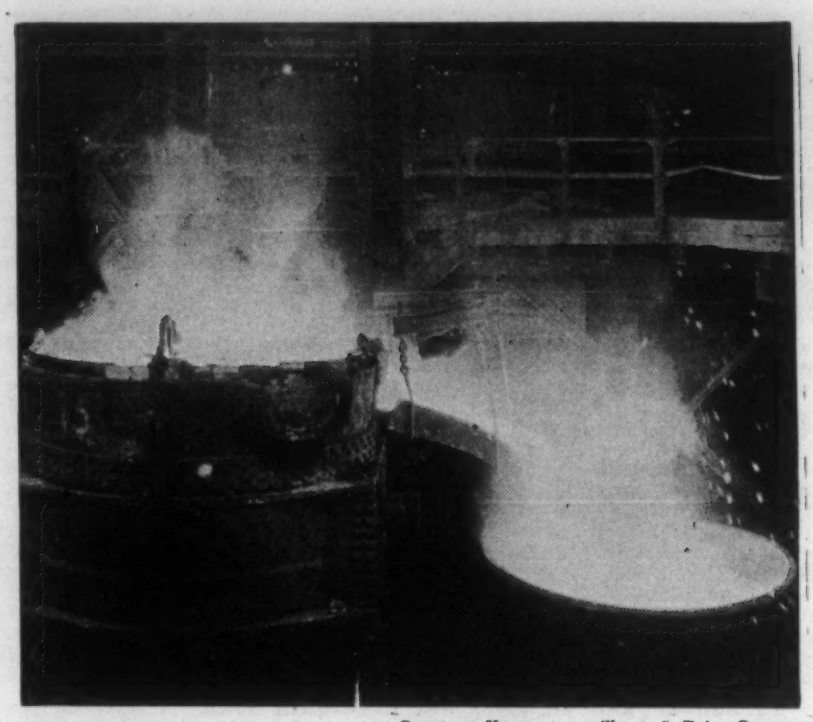
Modern Trends in Open-Hearth Operations. L. F. REINARTZ. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 51-53, 55.
To supply hot metal for the open-hearth some blast furnace operators are experimenting with the production of pig-Fe by reduced blast or by intermittent operation of the stack. For balancing operating rates between the open-hearth department and the mills, most plants have found it best to shut down excess furnaces and run a minimum number straight through the week. Various methods have been tried to prevent deterioration of furnace bottoms, such as filling the hearth with coke-breeze before the bottom has dropped below 500° F., or painting it with tar after it had reached room temperature. Several plants have insulated their bottoms with 2½" of insulating brick or cement, such layer having the same thermal conductivity as 4 courses of clay brick. Tabulates the thermal conductivity of different bottom materials in B.t.u./ft.^{2}/in. thickness/1° F./hr. Combustion control continues to hold main interest. Tendency, however, has been to do those things which can be done without purchase of expensive control equipment. Many plants have changed from producer gas to coke-oven or blast-furnace gases, fuel oil, or tar. Furnaces of 150 ton capacity have become well established. Use of 2 stopper rods in a ladle has helped some plants improve quality. Silica brick or high alumina brick has been used on the top courses of checker chambers, and a second quality brick in the lower courses. Experimental work is being conducted on a small scale open-hearth furnace equipped with oil burners, utilizing the principle of rapid heat transfer by direct contact of the flame with the bath. Herty has continued his work on inclusions. Much work remains to be done on effect of mold analysis and design on quality.
MS (12a)

Open Hearth Establishes Unusual Production Record. *Steel,* Vol. 90, Feb. 29, 1932, pages 27-28.
Notes on the record and operation of a 100-ton open-hearth furnace for the Laclede Steel Co. of Alton, Ill. A total of 1746 heats were run in 3 campaigns, the third campaign yielding 676 heats with a total output of 66,000 tons of steel. The general points of construction and the special features of insulation are described in some detail. JN (12a)

Avoiding Failure in Melting Used Metal. (Ausschussverhütung beim Einschmelzen von Altmetall.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, pages 264-266.
Practical hints. GN (12a)

Open-Hearth Metallurgy in 1931. C. H. HERTY, JR. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 49-50.
Review of American developments during the year. Trend is toward furnaces averaging 150 tons capacity. Use of the mixer-type transfer ladle is growing. There is considerable possibility of making real progress toward S elimination in this type. Changing of fuel on a given furnace has given operators a great deal of trouble. A number of plants are experimenting with 2 and 3 pass checkers. Insulation of furnaces has been stressed. Alloy contamination of plain C open-hearth steel is under investigation. During the winter months of 1931, average alloy contamination of 24 plants was: Cr, 0.017%; V, 0.005%; Ni, 0.039%; Cu, 0.086%, and Sn, 0.005%. Average residual Mn was 0.18%. Many plants are controlling slag by making a quick determination of FeO in a given volume of crushed slag and regulating their additions or working their heats according to the results of the determination. New deoxidizers are being developed rather slowly. MS (12a)

Melting Fine Silver in High-Frequency Induction Furnace. DANIEL L. OGDEN. *Brass World,* Vol. 28, July 1932, page 144.
Operating data are tabulated for an Ajax-Northrup induction furnace rated at 100-kw. and the melting of 429 kg. of Ag per charge. The direct savings do not warrant the high installation cost, but the cleanliness, ease of operation, and lack of metal loss have been distinctly advantageous. WHB (12a)



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Quantity Production of Stainless Steel. J. A. McWilliam. *Iron & Steel of Canada,* Vol. 15, June 1932, pages 71-73.

Address before the Montreal Chapter, A.S.S.T., in which the author deals with the general problem of the manufacture of stainless steel and with certain of the uses to which these alloys, particularly Firth's "Staybrite," have been put. OWE (12a)

On Basic Open-Hearth Slags. (Beitrag zur Frage Basischer Siemens-Martin Schlacken.) Alfred Klaus & N. Wark. *Archiv für das Eisenhüttenwesen,* Vol. 5, June 1932, pages 603-608.

Report 230 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. 3 special and complete runs were made to determine amounts of Fe and Mn passing into the slag as affected by the basicity of the slag The ratio $\frac{CaO}{SiO_2} = v$ is used to designate basicity. The composition and weight of charge, analysis of steel and slag, amount of ferromanganese for deoxidation, and Fe and Mn losses during course of process, with varying v ratios of 0.83 to 4.01 for the 3 charges are completely tabulated. These 3 tests and the results of a series of supplementary tests confirm the previously established conclusions, that during the melting and deoxidation period the Fe loss to the slag decreases with increasing SiO_2, while it increases with rising basicity. The relation of Mn loss to degree of basicity of the slag is not exactly clear and definite, or at least not as clearly defined as for Fe loss. The amount of slag apparently affects the Mn loss. The relation and the effect of SiO_2 content and amount of slag are given. In addition there are also brought out the reciprocal relations between oxide content of the slag and the amounts of O and reducing agents of the metal bath. Includes discussion. DTR (12a)

Carbon-oxygen Equilibrium in Liquid Iron. H. C. Vacher & E. H. Hamilton. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 124-140.

Includes discussion. See *Metals & Alloys,* Vol. 2, July 1931, page 134. (12a)

Processing of Copper Sand Castings of Highest Conductivity. Deoxidation with Beryllium. (Herstellung von Kupfersandguss höchster Leitfähigkeit. Desoxydation mit Beryllium.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 29, 1932, page 226.

Be is the only deoxidizer which permits producing Cu of highest electrical and thermal conductivity with greatest effectiveness. Cu used, melting process, deoxidation, casting and mold are discussed. Deoxidation is performed immediately upon removing the crucible from the furnace. About 110- 120 g. of a 10% Be- Cu alloy are sufficient for deoxidizing 100 kg. of Cu. Pieces of this alloy, wrapped in Cu-foil, are stirred into the melt. For stirring graphite coated iron bars are used. GN (12a)

The Deoxidation of Copper by Means of Metallic Calcium, Zinc, Beryllium, Barium, Strontium and Lithium. (Die Desoxydation des Kupfers mittels metallischen Kalzium, Zink, Beryllium, Barium, Strontium und Lithium.) *Die Metallbörse,* Vol. 22, May 28, 1932, pages 674-675.

The danger that a surplus of the added deoxidizer is liable to alloy with Cu and reduce its electric conductivity is stressed. Ca up to 0.4% hardly influences the physical properties of hard drawn Cu wire. A surplus of Ca is insoluble in Cu and largely affects the conductivity. Up to 0.2% Ca, the electric conductivity is reduced 10% by each 0.05% Ca. According to the writer, Ca is a very suitable deoxidizer. Zn up to 0.4% reduces but slightly the physical properties of hard drawn Cu. Up to 0.3% Zn, the electric conductivity drops 0.8% by each 0.05% Zn. Regarding Be, 0.05% reduces the conductivity about 10%. The effects of Ba, Sr, and Li are shown in a table. Ba and Sr are favorable deoxidizers, but the initial costs are too high. Li readily oxidizes and quickly reacts with refractory material of the furnace. EF(12a)

The Desulphurization Reactions in the Present Methods of Production of Steel and Pig Iron. (Beitrag zur Frage der Entschwefelungsvorgänge bei den heutigen Verfahren der Stahl- und Roheisenerzeugung.) Clemens Bettendorf & Nicholas J. Wark. *Stahl und Eisen,* Vol. 52, June 16, 1932, pages 577-582; June 23, 1932, pages 606-612.

Report 231 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. The subject is treated in 2 parts; the first part dealing with a laboratory study of various conditions affecting desulphurization of pig Fe and steel, while in the second part the laboratory results were checked by tests carried out on a large scale in regular operation. Melts of different classes of steel were made in a low frequency electric furnace, electric arc furnace, straight and tilting open-hearth furnace, while for foundry pig Fe, desulphurization was followed in the blast furnace. The authors summarize their work as follows: For rapid and good desulphurization the most important preliminary conditions along with time of reaction and a suitable temperature, are a high degree of basicity and a large amount of slag. Lime is the basic material in eliminating S. Its action in removal of S is heightened, if the lime is dissolved in a solvent such as fluorspar, bauxite or the like. SiO_2, instead of fluorspar, has a favorable effect only with small additions. Fluorspar permits S in the slag to escape as volatile matter. Through reduction of the S content in the slag it can then take up new amounts of S from the bath. A higher Mn content of the metal bath likewise yields better desulphurization. By the use of stronger bases, such as strontia, potash, soda, the desulphurizing action of the slag may be considerably improved. The alkali chlorides, rock salt, sylvite, carnellite, are also good expedients, acting as reducing agents in the bath. A further rise in desulphurizing action of properly-composed slag occurs, if these reducing agents are present. With the maximum action of these reducing agents (carbide formations in electric furnace), the maximum S removal is attained. In addition several comparative considerations are presented on S removal in the blast furnace. Includes discussion. 23 references. DTR (12a)

Casting & Solidification (12b)

For Users of Cylindrical Shapes. *Inco,* Vol. 11, No. 2, 1932, pages 9-10.

The practice of centrifugal casting is discussed and the advantages due to uniformity of wall thickness of pipes or of the covering when cast on other parts are pointed out. Besides, impurities are separated due to the pure metal being heavier and thus pressed to the outside, oxides, gas, slags, etc., floating on the interior surface; a very dense casting is therefore produced having great uniformity of structure and high tensile strength. The following table shows comparative figures for some centrifugally cast metals and alloys:

Composition	Copper	Standard Bronze	Gunmetal	Manganese Bronze	Monel Metal
Copper	100	85-87	86-89	55-60	23 min.
Tin	—	4-6	7.5-11	1.5	—
Zinc	—	4-6	1.5-4.5	38-42	—
Lead	—	3-5	0.3 max.	0.2 max.	—
Nickel	—	0-1	0.75 max.	—	60 min.
Manganese	—	—	—	3.5 max.	3.5 max.
Aluminum	—	—	—	1.5 max.	—
Iron	—	—	—	0.4-2.0	3.5 max.
Carbon & Silicon	—	—	—	—	2.0 max.
Average Tensile Strength lb./in.^{2}	25,000 to 27,000	33,000 to 45,000	44,000 to 49,000	65,000 to 110,000	65,000 to 100,000
Average Elongation %	40 to 45	20 to 25	25 to 35	15 to 20	15 to 25

A few examples of special cases where very thick layers were cast are described. Ha (12b)

Instantaneous Conversion into Ingots of Metals and Alloys on Casting. (Le lingotage instantané des métaux et alliages à la coulée.) *Journal du Four Electrique,* Vol. 41, June 1932, pages 215-216.

Teeming of ferro alloys through a nozzle into ingot molds always causes too much liquation and non-uniformity in composition. Casting them on the floor and crushing produces too much dust and losses. A combination of ladle and ingot mold solves the problem. The ladle is semi-cylindrical and is supported on trunnions provided with proper gearing for turning it around its horizontal axis. The metal is tapped into it as usual, the slag is removed by appropriate means and a lid is fastened to its top. The lid actually forms a heavy chill capable of holding all the metal in the ladle. Rotating the ladle the metal is transferred into the lid and solidifies there almost instantaneously without any liquation whatever. The apparatus was successfully used in the plants making ferro silicon. JDG (12b)

Causes of Warping in Casting Pipes. (Ursachen für das Krummwerden von Rohren beim Giessen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, pages 259-260.

The various causes of warping in casting pipes are enumerated, the remedies are discussed. GN (12b)

Liquation or "Inverse Segregation" in the Silver-Copper Alloys. J. H. Watson. *Institute of Metals, Advance Copy* No. 620, Sept. 1932, 12 pages.

Liquation or inverse segregation was studied by holding various alloys at a temperature between the liquidus and solidus for several hours and then either slowly cooling or cooling in such a manner as to chill only a portion of the melt. The primaries of Ag or Cu were free to rise or fall under the influence of gravity. In a Cu-rich alloy the top was enriched in Cu due to the rise of the Cu primaries. In the slowly cooled Ag alloys the top was enriched in Cu due to the falling of the heavy Ag-rich primaries. It was also established that the primaries which have segregated under the influence of gravity are repelled from their position by the application of severe local chilling in their vicinity. The effects observed in these alloys in ordinary practice can be explained by the formation of primaries at the chilling surfaces of the mold and between the temperatures of the liquidus and solidus, followed by their immediate migration towards the hotter portions of the mass. Segregation in several complex coinage alloys was also studied. JLG (12b)

Change in Composition of Steel and Slag During Tapping from Furnace into the Ladle and During Casting into Ingot Shapes. (Veränderung der Zusammensetzung von Stahl und Schlacke beim Abstechen aus dem Ofen in die Pfanne und beim Vergiessen in die Blockformen.) Nicholas J. Wark. *Archiv für das Eisenhüttenwesen,* Vol. 5, Apr. 1932, pages 503-510.

Report 225 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. Different classes of steel, produced in a 15-ton Heroult and in 17 and 65-ton open-hearth furnaces, were studied. Changes occurring during tapping of steel and slag into ladle and during casting period were all tabulated. During casting of electrolytic steel no appreciable changes occurred between metal and slag due to low metal oxide slag. Far different was the behavior with rich metal oxide open-hearth slag. With non-Si soft ingot steel, Mn dropped toward the end of the casting period, while P and S increased. With Si-steel, Mn increased toward end of casting, while Si decreased. Also P increased directly with amount and fluidity of slag. S remained constant, but if an increase in S was found in an exceptional case, this increase was never as high as in case of non-Si soft ingot steel. Precautions for reducing combinations between metal and slag are given. Using suitable methods the composition changes of steel may be greatly diminished. Ladle slag may be distinguished from furnace slag by reduction in CaO. Strong increase in SiO_2 and Al_2O_3 and changes vary with different brands of steel. The hotter layer of ladle slag in immediate contact with metal bath reacts more vigorously and produces more changes than the top heat-radiating layer. Simultaneous with SiO_2 increase, decomposition of reducible oxides occurs in ladle slag. DTR (12b)

Casting of Roll-like and Cylindrical Bodies. (Das Giessen von walzenförmigen und zylindrischen Körpern.) G. Krebs. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 24, 1932, pages 287-289.

Chemical composition, production, properties and testing of castings for piston rings and cylinders are discussed. The advantages of hot casting are emphasized, as favorable crystallization of graphite and separation of occluded gases. GN (12b)

Rolling (12c)

Why Sheets are Thicker at Center. W. H. Melaney. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 61-63; *Iron & Steel of Canada,* Vol. 15, Feb. 1932, pages 15-16.

Thin plates and sheets have a greater thickness at the center than at the edges. Common explanation for this condition is that the rolls bend at the center of their length, thus producing a slightly greater aperture at the center of the roll face. Author attempts to disprove this theory by pointing out that rolls of the 2-high type are of such massive proportions as to preclude any spring; that the larger the diameter of the plate rolls, the greater is the difference in thickness, other conditions remaining the same; and that in 3-high and 4-high mills using small diameter rolls, there is less difference in gage between middle and edges. Advances the theory that the elastic restoration of the metal being rolled is primarily responsible. In rolling a sheet, the steel flows sidewise as well as lengthwise. The side flow is from the center toward each side, but as the molecules in the center are resisted in their motion by all those from the center to the sides, they are forced to pile up there. The resistance becomes gradually less as the molecules approach the sides, resulting in a gradual reduction of the thickness from the center to each side. On emerging from the rolls, elastic restoration takes place in proportion to the stress set up, and as this was greater in the center, the metal comes back more in the middle and produces the heavier gage. OWE+MS (12c)

What Happens when Rolling Thin Sheets. W. H. Melaney. *Blast Furnace & Steel Plant,* Vol. 20, Apr. 1932, pages 335-337.

Lubrication of the roll faces during rolling and tension on the sheet in the direction of the flow of the metal during reduction produce less crown on the sheet. These conditions can be explained by the author's theory of elastic restoration of the metal published in *Blast Furnace & Steel Plant,* Jan. 1932. Much more attention should be given to the roughing stage and to obtain the correct shape of roughed sheets, so as to reduce troubles on the finishing rolls. Pinched sheets are caused by the rolls' biting of the edges of the pack before the center, thus forcing the flow of the metal toward the center where it piles up and laps over. End of properly roughed sheet should have a slightly concave curve with corners slightly rounded. Steam should be applied to the face of the rolls through perforated pipes; the sizes of the openings being reduced from the center toward each end. The proper shape of the rolls can thus be maintained. MS (12c)

Electric Roll Heaters. *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, pages 272-273.

Same as article by R. J. Wean in *Rolling Mill Journal,* Vol. 5, Aug. 1931, pages 523-526, 558. See *Metals & Alloys,* Vol. 3, May 1932, page MA 136. MS (12c)

Preheating Sheet Mill Rolls. Arthur J. Whitcomb. *Blast Furnace & Steel Plant,* Vol. 20, Apr. 1932, pages 344-345, 363, 370.

See "Comparison of Methods used for Electrically Preheating Sheet Mill Rolls," *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 45. MS (12c)

Developments in Non-Ferrous Metal Rolling Mills. L. Weiss. *Metallurgia,* Vol. 5, Mar. 1932, pages 173-176.

Translation of article in *Zeitschrift für Metallkunde,* Vol. 23, Mar. 1931, pages 73-76. See *Metals & Alloys,* Vol. 2, Oct. 1931, page 224. JLG (12c)

New Seamless Tube Reducing Machine. *Iron & Coal Trades Review,* Vol. 125, July 8, 1932, page 39.

In this method, the tubes are reduced not by tension but by compression; this is done by rolls profiled in a certain manner and operating discontinuously. The reduction per pass possible for different metals and necessary treatment are briefly described. Ha (12c)

Sleeve-Type Roll Neck Bearing Connects to Circulating Oil System. *Steel,* Vol. 90, Mar. 21, 1932, page 35.

Description of a new, fully enclosed, flood lubricated, sleeve-type roll neck bearing for rolling mills developed by the Morgan Construction Co., Worcester, Mass. JN (12c)

Manufacture of Sheet Steel. *Iron & Coal Trades Review,* Vol. 124, May 13, 1932, pages 793-796.

The equipment of a modern steel mill and the methods of backing-up rolls are briefly discussed; the installation, layout, operation, annealing of the sheets and rolling of sheets are described. Ha (12c)

Automatic Rolling Mill Screw-Down. (Selbsttätige Anstellvorrichtung für ein Walzwerk.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 15, 1932, page 265.

The device has a control switch and a contact brush running over contacts. The contact brush is attached to a support which makes a rotating motion in parallel with the adjusting device. On a slideway of the support the contact brush simultaneously with the rotating motion makes a radial one so that the motion of the brush actually is spiral-like. According to the rolling schedule the contacts of the contact path which are arranged in suitable distances are connected with the steering mechanism. As soon as the contact brush gets in contact with these tapped contacts the adjusting of the rolls takes place as desired. GN (12c)

Shearing & Punching (12e)

Metal Working in Power Presses. E. V. Crane. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 284-316.

Includes discussion. See *Metals & Alloys,* Vol. 2, May 1931, page 106. (12e)

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Extruding (12f)

A Metal Tube Extrusion Press of 3850 Tons Pressure. *Hydraulik Review,* Vol. 2, No. 2, 1932, pages 1-9.

The construction and operation of the press and all auxiliary tools are described in detail; it presses tubes of any bore up to 11 4/5" starting with a bore of about 4". It makes bars of 3" to 8" diameter and sections of every description including hollow or tubular sections. The press can work both directly and indirectly that is, either by moving the hydraulic ram, or moving the piece to be extruded over the stationary ram; by this latter process savings of 30 to 50% can be made. Ha (12f)

The Extrusion of Metals. R. Genders. *Metal Industry,* London, Vol. 40, Mar. 25, 1932, pages 345-349.

The process of extrusion is described. PRK (12f)

Machining (12g)

Tools, Contrivances and Equipment for Turning and Grinding Sphere-Shaped Parts. (Werkzeuge, Vorrichtungen und Einrichtungen zum Drehen und Schleifen kugliger Werkstücke.) A. Winter. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, July 10, 1932, pages 77-79.

Discusses tools and other equipment to be used for economically turning sphere-shaped parts. GN (12g)

Chromium Plating of Tool Cutting Edges. (Verchromen von Werkzeugschneiden.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Aug. 14, 1932, page 433.

Tools with Cr-plated edges are particularly suitable for machining light metals. Use and advantages of Cr-plated tools are briefly discussed. The life of such tools is increased considerably, for instance, reamers stand up 25 times longer than non-Cr-plated, files 3-8 times longer. GN (12g)

Machining the Magnesium Alloy Elektron. *Machinery,* Vol. 38, Mar. 1932, pages 532-533.

Elektron is a light weight alloy consisting chiefly of Mg with Al, Mn, Zn and Si in variable amounts. Specific gravity 1.8, tensile strength from 6.3 to 25.3 tons/in.^{2}, compressive strength 19 to 28.6 tons/in.^{2}, elongation 2 to 18%, Brinell hardness 42 to 90. Varying composition accounts for this range of properties. Melting point 1200° F. Not affected by alkaline solutions. Corrodes slightly when exposed to air. Discusses applications, and machining methods. RHP (12g)

The Chippability of Cast Steel in the Drilling Process. (Die Zerspanbarkeit des Stahlgusses im Bohrvorgang.) A. Wallichs & H. Beutel. *Die Giesserei,* Vol. 19, June 24, 1932, pages 241-247.

Contrary to the facility of turning cast steel the possibility of its being drilled is greatly influenced by the formation of the chips which cannot be removed so readily as in turning. An investigation of various steel material showed, just as for turning, a dependence on the hardness of the material. Increasing contents of C and especially of Si reduce the drillability. A refined Cr-Ni steel is more difficult to drill than an unrefined steel. A higher tempering temperature improves the drillability. Ha (12g)

New and Improved Tools at the Leipzig Technical Fair 1932. (Neuartige und vervollkommene Werkzeuge auf der Technischen Messe 1932.) Schlippe. *Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, May 10, 1932, pages 53-56.

Description of cutting and measuring tools. GN (12g)

On a New Method to Increase the Durability of Cutting, Stamping, Pressing and Forging Tools. (Über ein neues Verfahren zur Verlängerung der Lebensdauer von Schnitt-, Stanz-, Press- und Schmiedewerkzeugen.) *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Apr. 10, 1932, page 49.

The life of tools for the above purposes can be increased by heating them during the operation. Several examples are given. By cutting, for instance, a steel sheet with 1.28% C and about 2% Cr the cutting edge of the straight carbon blade stood up before re-grinding 35,000 cuttings; however, by heating the blade to 175° C. it made 65,000 cuttings. Similar favorable results were obtained in heating forging dies. GN (12g)

Tests of New High Speed Tool Steels for Improvement of Efficiency. (Prüfung der Wirtschaftlichkeit neuer Werkzeugstähle zwecks Verbesserung der Werkstattleistung.) W. v. Schütz. *Maschinenbau,* Vol. 11, Jan. 21, 1932, pages 33-37.

For any fixed program of production and any given equipment, a method is presented for selecting the most economical (not necessarily the best in quality) kind of tools to be employed. 7 references. RV (12g)

New Developments in Machining Aluminum and Its Alloys. R. L. Templin. *S. A. E. Transactions,* Vol. 25, 1930, pages 275-278. See *Metals & Alloys,* Vol. 2, Feb. 1931, page 43. (12g)

Vibration-less Machining of Hollow Bodies. (Erschütterungsfreie Bearbeitung von Hohlkörpern.) O. P. van Steewen. *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, May 10, 1932, pages 54-55.

The outside wall of thin-walled tubes can be machined with the greatest accuracy when, before machining, the tube is filled with a liquid of small thermal expansion and small elasticity, for instance, water or oil. During machining any heating should be avoided. GN (12g)

The Chippability of Materials. (Die Zerspanbarkeit der Werkstoffe.) W. Leyensetter. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, Mar. 1932, pages 243-256.

In order to be able to compare the various cutting or chipping conditions a so-called cutting characteristic is developed $= l/s \times t$, where l is the length of the arc of the cut, s the feed and t the depth of the cut. With this characteristic the various metals can be classified with regard to their machinability and their relations to other properties be investigated. Ha (12g)

Cemented Tungsten Carbide for Cutting Tools. L. J. St. Clair. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 139-146.

See *Metals & Alloys,* Vol. 2, Feb. 1931, page 44. Ha (12g)

Polishing & Grinding (12l)

A Survey of Surface Quality Standards and Tolerance Costs Based on 1929-1930 Precision Grinding Practice. R. E. W. Harrison. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 111-125.

The paper reviews some of the defects existing in present-day standards of finish of mechanical components. Size control and its effect on cost of production is discussed, a scheme for the establishment of definite standards is suggested and a finish-calibrating instrument described. No short cut method to high quality work is available with a low factor of initial wear. Photographs of ground, polished and lapped surfaces are given. Ha (12l)

Fundamentals of Machine Polishing. Robert T. Kent. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 73-84.

The various factors entering in effective and economical polishing, as the polishing wheel, the abrasive, the glue used in setting up the polishing wheel, are discussed in relation to one another. Types of polishing machines and examples of successful machine polishing are described and illustrated. Ha (12l)

Refinements in Finishing Cylindrical Bores. J. W. Hindes & James G. Young. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 127-130.

The limitations of boring, reaming, burnishing and broaching as finishing operations on cylindrical bores have led to a general use of abrasives. The advantages of the expanding grinder, which consists of an expanding segmental wheel with a grinding surface being composed of a series of abrasive stones placed longitudinally upon the circumference of a metal body with an adjusting means for expanding the stones are described; they are essentially perfection of finish both as to straightness and roundness, absence of fuss, accuracy not dependent on skill of operator, high-speed production and low cost. Ha (12l)

Automatic Worm-Gear Grinding Machine with Hydraulic Adjustment of the Spindle Stock. (Selbsttätige Schneckenschleifmaschine mit hydraulischer Zustellung des Schleifspindelstocks.) Weil. *Die Werkzeugmaschine,* Vol. 36, Aug. 15, 1932, pages 279-281.

Illustrated description of the machine built by J. E. Reinecker A.-G. Chemnitz, Germany. GN (12l)

Micrometer Lap. F. J. Wilhelm. *Modern Machine Shop,* Vol. 5, July 1932, page 34.

A satisfactory way of lapping the end of a micrometer spindle by using a lap and a hub is described. It insures a perfect seat against the anvil of the micrometer. Ha (12l)

Technology of Grinding Tools in Precious Metal Industry. (Technologie des Werkzeugschliffs in der Edelmetallindustrie.) *Deutsche Goldschmiedezeitung,* Vol. 35, May 7, 1932, pages 192-195.

Detailed discussion of the grinding of tools to be used in the precious metal industry with special reference to the grinding materials used. GN (12l)

Application and Efficiency of Grinding Machines. (Schleifmaschinen, ihre Verwendung und ihre Wirtschaftlichkeit.) Meyer. *Zeitschrift für wirtschaftliche Fertigung,* July 1932, pages 91-92.

After an introductory discussion on the grinding process recent German constructions of grinding machines are described with special reference to their efficiency. GN (12l)

Coloring (12m)

Electrolytically Produced Oxidic Protective Coats on Aluminum and Its Alloys, in Particular for Metal Coloring. (Elektrolytisch erzeugte oxydische Schutzschichten auf Aluminium und dessen Legierungen, besonders auch für Zwecke der Metallfärbung.) Geo. Buchner. *Oberflächentechnik,* Vol. 9, June 21, 1932, pages 127-128.

Anodic oxide films on Al have 3 important properties: (1) the valve effect, (2) high insulation quality, and (3) the high protective value against corrosion and erosion, both chemical and mechanical. At the same time coloring effects can be produced if solutions of chromic acid, dilute H_2SO_4, oxalic acid, borax, boric acid, etc. are used. The oxide film is hard and can be polished with hard powders. The best current density is from 1 to 10 amp./dm.^{2}, the films are the harder the higher the voltage applied. Pure Al gives harder oxide films than the Al alloys. The color of the oxide layer depends on the thickness of the latter, on the electrolyte and also on the base material. Oxalic acid on pure Al produces yellow to brown depending on the thickness. Al oxide films can be dyed with organic dying materials in all colors by immersing them in the boiling color solutions. Ha (12m)

Sand Blasting (12n)

The Cleaning of Castings. (Le Dessablage des Pieces de Fonderie.) E. Tourneur. *Revue de Fonderie Moderne,* Vol. 26, May 10, 1932, pages 149-159.

The methods used in cleaning castings of sand are described and their economy discussed. The usual abrasives are sand and steel grit. The size of the grains of sand used for different materials are recommended as follows:

For Al	Approx.	0.5 mm.
brass	"	0.5-1.0 mm.
bronzes	"	1-2 mm.
small Fe castings	"	2 mm.
medium Fe castings	"	3 mm.
large Fe castings	"	3-4 mm.
steel	"	4-5 mm.

If steel grit is used the grains should be preferably angular. The pressures used for best results are given as:

Metal	Pressure with sand	Pressure with steel grit
Al, brass	0.8-1.2 kg.	1-2 kg.
bronze	1-1.5 kg.	1.5-2.4 kg.
cast Fe	2-2.5 kg.	2.5-3 kg.
steel	2.5-3.5 kg.	3-4 kg.

Several constructions of sand-blasting apparatus and auxiliary devices are described. Ha (12n)

MISCELLANEOUS (20)

Studies on Zinc and Barium Ferrites. JOSEPH GUILLISSEN & PIERRE J. VAN RYSSELBERGHE. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 95-106.

Includes discussion. See *Metals & Alloys,* Vol. 2, Aug. 1931, page 149. (20)

The Development of an Electron Emitting Alloy. O. S. DUFFENDACK, R. A. WOLFE & D. W. RANDOLPH. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 181-198.

Includes discussion. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 186. (20)

Strain at Complicated States of Stresses. (Beitrag zur Anstrengungsfrage bei zusammengesetzten Spannungszuständen.) J. BACH. *Ingenieurarchiv,* Vol. 2, Jan. 1932, pages 604-605.

The author shows in 2 cases that under the conditions given the theory of the largest change of shape is in better accordance with the testing results than the hypothesis of principal stresses. It is known that the hypothesis of principal stresses is not verified with other states of stresses and materials than those considered. However, the theory of the largest change of shape proved to hold true in all cases investigated, for brittle as well as tough materials. GN (20)

Investigation of Materials of Old Steam Boilers. (Werkstoffuntersuchungen an alten Dampfkesseln.) K. DAEVES, E. PFEIFFER & G. URBANCZYK. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, June 4, 1932, pages 551-556.

The material of 11 different boilers which had been in service from 22 to 44 years was examined under present conditions. No great changes of property in the boiler plate could be found but there existed a strong brittleness in all riveted seams. There was only a minor sign of corrosion. It is stated that it is risky to repair or move such boilers. Ha (20)

The Calculation of Torsional Vibrations in Crankshafts by means of the Table on Frequency Functions. (Die Berechnung der Drehschwingungen von Kurbelwellen mittels der Frequenzfunktionen-Tafel.) R. GRAMMEL. *Ingenieurarchiv,* Vol. 3, June 1932, pages 277-297.

The method developed by the author in former investigations (*Ingenieurarchiv,* Vol. 2, 1931, page 288; Vol. 3, 1932, page 76) on the calculation of free and forced torsional vibrations in crankshafts gives formulae which are easily evaluated by the tables of so-called frequency functions. The formulae have been checked for 19 various types of machines. 3 references. GN (20)

The Kinetics of the Decomposition of Ammonia on Copper. J. K. DIXON. *Journal American Chemical Society,* Vol. 53, May 1931, pages 1763-1773.

In this study it was found that no appreciable amount of Cu nitride formed, and that small amounts of CO poisoned the surface of the Cu. MEH (20)

Extraction of Beryllium, Caesium, and Rubidium from Beryl. C. JAMES, H. C. FOGG & E. D. COUGHLIN. *Industrial & Engineering Chemistry,* Vol. 23, Mar. 1931, pages 318-320.

A simple and economical method has been developed for producing pure beryllium oxide from beryl, using ordinary chemicals and apparatus. Any small quantity of caesium and rubidium which may be present in the mineral can be obtained at the same time. The method is applicable either on a commercial or laboratory scale. With only a few changes, the principles of this method can be adapted to the extraction of these elements from other silicate minerals. MEH (20)

The Collapsing Strength of Steel Tubes. T. MCLEAN JASPER & JOHN W. W. SULLIVAN. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 219-245.

An analytical treatment is given for the determination of the collapsing strength of steel tubes on the basis of the physical and elastic properties of the metal in the tube, and the dimensions, out-of-roundness, and variations in the thickness of the tube. The formulas are developed in terms of compressive stress instead of external pressure and examples of commercial tubes are treated for the illustration of the method. In an appendix is described the experimental work done by the A. O. Smith Corporation and another appendix reviews the work of previous investigators in this subject. Several tables are compiled showing the collapsing pressure with respect to physical dimensions. Ha (20)

Spark Analysis in the Machine Shop. (Die Funkenanalyse im Werkstättenbetrieb.) A. HERR. *Werkzeugmaschine,* Vol. 36, July 15, 1932, pages 240-241.

The paper discusses the spectroscopic investigation of materials. The advantages of the spark analysis are outlined. Local fluctuations of the chemical composition are to be detected that cannot be detected by chemical analysis. Examination of tool steel and steel scrap is discussed. Quantitative determination of the following elements is impossible: V, above 1%; Ti, 0.168% and more; Ni, 0.1%; Cr, 0.5%. GN (20)

Analysis of Stresses in Circular Plates and Rings. E. O. HOLMBERG & K. AXELSON. *Transactions American Society of Mechanical Engineers,* Vol. 54, Jan. 30, 1932, Applied Mechanics, pages 13-28.

A theoretical investigation with special regard to application to cylinders with rigidly attached flat heads and flanges. A simplified method is derived for the calculation of stresses in flat, circular plates with or without hole in the center and with loads uniformly distributed around the center. Ha (20)

Torsional Vibrations in Crank Shafts. (Erzwungene Torsionsschwingungen in Kurbelwellen.) S. GRADSTEIN. *Ingenieurarchiv,* Vol. 3, May 1932, pages 206-214.

The vibrations in crank shafts were studied by a method developed by W. Prager (*Ingenieurarchiv,* Vol. 1, 1930, page 527). The vibrations were studied in the various sections of a shaft which had been loaded with flying disks. From the dimensions of the shaft, the amplitudes of the vibrations, the phases and frequencies of the exciting torques the deflections of the shaft and the stresses thus originating were calculated. 4 references. GN (20)

FOUNDRY PRACTICE & APPLIANCES (22)

Superheating and Heat-treating of Grey Cast Iron. J. W. DONALDSON. *Metallurgia,* Vol. 6, June, 1932, pages 49-52.

Mainly a review of published work on these subjects. JLG (22)

New Process Manufacture of High-Duty Cast Iron. *Metallurgia,* Vol. 6, June 1932, pages 35-38.

Points out advantages of rotary melting furnaces, and describes installation at W. G. Armstrong Whitworth and Co. plant. A high-test iron suitable for both large and small castings can be produced in these furnaces. JLG (22)

Processing of a Mold for the Casting of Armature Casings. (Herstellung einer Kokille zum Giessen von Armaturgehäusen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 12, 1932, pages 244-245; June 26, 1932, pages 266-268.

Detailed discussion of the procedure to be followed. GN (22)

Discusses Manufacture of Titanium Aluminum Bronze. CHARLES VICKERS. *Foundry,* Vol. 60, Mar. 1, 1932, pages 36-40; Apr. 1932, pages 44-45, 82, 84.

A series of 2 articles on the development and founding of Ti-Al bronze. Ti-Al bronze is a modern Cu, Fe and Al alloy and contains only traces of Ti, developed in 1916. Investigations to discover a degasifier which would give satisfactory results led to the development of a combination of which Ti was one. To obtain the desired homogeneity in degasifying alloy it was necessary to melt it twice. Good results could be obtained by making first a primary alloy which combined with other elements to form the final alloy. VSP (22)

Processing of a Ship Screw Hub in Loam and Sand Mold respectively. (Herstellung einer Schiffspropellernabe in Lehm- bez. Sandform.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 10, 1932, pages 285-289.

Detailed and illustrated description of the procedure in loam or sand molding the hub of a ship screw. GN (22)

The Production of Malleable Iron in the Cupola with Higher Amounts of Scrap and High Silicon Cast Iron in the Burden. (Die Herstellung von Temperguss im Kupolofen bei Verwendung von höheren Schrottzusätzen und hochsilizierten Roheisensorten.) H. SPRINGKÄMPER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, pages 254-257.

On the basis of tests and practical experience the author states that the use of higher amounts of scrap and high Si cast Fe offers no economic advantages in processing malleable Fe. There are also metallurgical difficulties due to fluctuations of the Si content and increase of the S content. The author is of the opinion that the disadvantages of the scrap process which is advocated by Stotz (*Zeitschrift für die gesamte Giessereipraxis,* Vol. 55, Jan. 24, 1932, pages 42-44; Feb. 7, pages 58-59) become evident only in the course of time. Calculations on the economy of the pig Fe and the scrap process for making malleable Fe. GN (22)

The Working of Rotary Pulverized Fuel Fired Melting Furnaces. W. SCOTT & S. E. DAWSON. *Foundry Trade Journal,* Vol. 46, June 2, 1932, pages 335-338.

An article, accompanied by discussion, which deals with the practical considerations of metal-melting in rotary furnaces of the Sesci type, and discusses the metallurgical considerations of the process. The article deals almost entirely with the manufacture of cast Fe. OWE (22)

Effect of Temperature on Physical and Casting Properties of No. 12 Aluminum Alloy. GEORGE H. STARMANN. *Metal Industry,* N. Y., Vol. 30, May 1932, pages 181-182.

Experimental results are given showing that the physical properties of No. 12 Alloy, cast in sand, decrease as the pouring temperature is raised above 1300° F. The effect of high melting temperature is markedly less harmful than that of high pouring temperature. Indications are that soaking at high temperatures has an effect upon the metal not produced by soaking at normal temperature. PRK (22)

On the Distortion of Large Castings. (Ueber das Verziehen von langen Gusstücken.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 29, 1932, pages 217-220.

The paper deals with practical experience to avoid warping of large castings. The molding practice is particularly considered and outlined in several examples. GN (22)

Core-prints and Locating of Cores. (Kernmarken und Kernlagerungen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 24, 1932, pages 296-297; Aug. 7, 1932, pages 315-318.

The paper discusses the proper locating of cores, as for columns, pipe joints, radiator parts, drainage pipes, etc. Practical examples are given. GN (22)

The Properties of Good Glues for Pattern Making and Its Liquefaction. (Die Eigenschaften guter Holzleime für den Modellbau und ihre Verflüssigung.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, pages 336-337.

The paper discusses the properties of bone-glue and skin-glue. Color and transparency are not always indicative of quality. Of prime importance for the quality is the content of gluten. Soaking and the processing of glue-solution must be done carefully to attain highest bonding capacity. Proper heating apparatus is required. GN (22)

Ferrous and Non-Ferrous Metals in the Foundry. W. ROSENHAIN. *Foundry Trade Journal,* Vol. 46, June 9, 1932, pages 354-356, 358.

The author opens his paper by analyzing the differences between ferrous and non-ferrous metals with the view of indicating the problems which are common to both. Considerable attention is directed to the role of metallic molds in foundry practice. The subjects of mold dressings and core binders are dealt with in some detail, the author criticizing the use of so-called "flaming" dressings, pointing out very clearly the dangers which may arise from the use of such materials. The corrosion of cast alloys receives brief attention, and the question of competition from forged materials is likewise discussed. The author refers in closing to the inspection, sampling and testing of castings. OWE (22)

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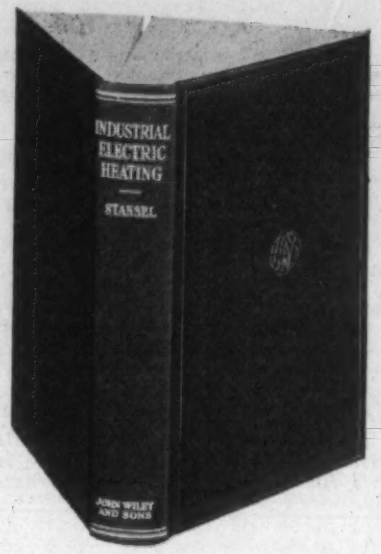

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FURNACES & FUELS (23)

Industrial Electric Heating. N. R. STANSEL. John Wiley & Sons, Inc., New York, 1933. Cloth, 6¼ x 9¼ inches, 444 pages. Price $5.00.

Electric furnaces are important tools in metal melting, in heat-treating and in many other processes with which the metallurgist is concerned. While this book has a broader title and a broader scope than metallurgy alone, nearly every page is of metallurgical interest.

Stansel's method of attack upon a problem in electric heating is to survey the process to be carried out from the point of view of the chemical and physical requirements and limitations, and from these to engineer the equipment that will serve those needs. Hence, there is straight-to-the-point discussion of heat transfer, effect of heat on metals, effect of furnace atmosphere, electrical properties of furnaces, etc., which, though aimed at electric furnaces in particular, is good fundamental heat engineering and valuable to many who may not be directly interested in electric furnaces. The points are driven home by specific examples of typical furnaces and their application, but so deftly is this done that minor details germane only to a single application are pretty much avoided and each example serves to bring out general truths. The illustrations and curves are well chosen. Each one clarifies the text. The engineer who studies the book will therefore not find his mind cluttered up with a mass of useless details, but instead will obtain a good foundation of essential principles, widely applicable, and will be led to sound methods of thinking. It is not a college text book nor a handbook of data, but is extremely well fitted for the self-improvement of the graduate engineer or metallurgist up against heating problems.

The book is gratifyingly free from sales propaganda harping on the superiority of electric over fuel-fired furnaces. The final chapter discusses some of the elements of an economic choice among furnaces, and of course, the fitness of the electric furnace for given types of service is brought out all along, but in general, the assumption is made that the furnace user is seeking a result best obtained by electric heating and one that will stand the first cost, and the discussion proceeds from there.

The book does not cover everything that its title might include. It does not deal with the lowest temperature ranges, such as those involved in curling irons, core ovens, etc., nor does it deal with ferro-alloy production. Many of the principles discussed are, of course, applicable to the subjects not covered. The subjects dealt with are primarily those in which the greatest number of industrial furnace users are concerned. One omission which metallurgists will wish had not been made is that of nitriding to which only casual reference is given.

Batch and continuous resistor furnaces of types suitable for heat-treatment of steel, annealing of non-ferrous metals, enameling, annealing of glass, etc., are well covered. Metal melting is dealt with from type metal up through brass and steel, involving rather thorough treatment of external and submerged heating units, direct and indirect arc furnaces, vertical ring and high frequency induction furnaces. There is very interesting discussion of hydrogen brazing.

Obsolete furnaces are not discussed. Few authors would have shown the restraint that Stansel has in ruthlessly omitting the historical and confining himself to matters of present engineering interest. The book is noteworthy for the things it doesn't waste space on and for the clarity and conciseness of what it does present. The author's long experience with the General Electric Company in the lines covered by the book has enabled him to treat his subject with authority. Beside being a highly informative volume, it is an extraordinarily good job of technical writing. 115 references. H. W. Gillett (23)-B-

Heat Exchange in Modern Industrial Practice. II, III. BASIL HEASTIE. *Industrial Chemist,* Vol. 8, Mar. 1932, pages 87-89; May 1932, pages 172-174.

With the first article of this series appearing in Nov. 1931, these articles comprise a discussion of various methods and formulae. The author attempts to correlate existing data. RAW (23)

Copper and Heating with Heavy Oils. (Le Cuivre et le Chauffage aux Huiles Lourdes.) *Cuivre et Laiton,* Vol. 5, June 30, 1932, pages 271-272.

The use of heavy oils, as mazout, etc., as fuels for industrial furnaces, particularly in the Cu industry, is discussed. Automatic regulation of combustion and temperature, safety and cleanliness are advantages. Burners use any pressure up to 700 g./cm.^{2} and higher; medium pressure burners (150 to 400 g./cm.^{2}) are at present those most generally employed for industrial furnaces. A few constructions are described. Ha (23)

Cleaning Coal. RALPH H. SWEETSER. *Blast Furnace & Steel Plant,* Vol. 20, Feb. 1932, pages 171-174.

Discussion of papers on coal cleaning read at the Third International Conference on Bituminous Coal, Nov. 1931. Proposes that the coal industry adopt as a base-line for evaluating all coals the analysis of the coal as shipped. The base-line percentage of total ash + moisture should be set at 12.7% as this is a fair figure as a basis of evaluation of all kinds of coals and is impartial to the various methods of cleaning coal. It is uniform with the generally accepted standard for blast-furnace coke, which is 90% fixed C (at 212° F.) and 3% moisture, equivalent to 87.3% fixed C in the coke as received. The steel industry has the most to gain from coal cleaning as the benefits that accrue are pyramided in steel making. It is calculated that 1% ash in coking coal adds 30¢/ton of pig-Fe to the cost of pig-Fe made by the coke from that coal. Coal cleaning is of especial importance to the Pittsburgh steel industry, because it will lead to lower operating costs, and thus enable Pittsburgh to meet the competition of other favorably located steel producing districts. MS (23)

The Use of Gas as a Fuel in Industry. C. M. Walter. *Gas World,* Vol. 96, June 11, 1932, pages 611-614; Vol. 97, June 18, 1932, Industrial Gas Supplement, pages 10-20.

Includes discussion. The paper covers the following subjects: metal melting, japanning and drying operations, forging, central heating, economic value of gas as a fuel, coke oven gas, application of town's gas to high speed internal combustion engines, experiments carried out at Birmingham, the results of these tests and the percentage of CO in exhaust gases. The author's conclusions are: (1) The thermal efficiency of high speed internal combustion engines when supercharged is greater when using town's gas than when gasoline is used, and is further increased by carburetting the gas with benzol. (2) The thermal efficiency with gasoline as a fuel is decreased by the application of supercharging. (3) The maximum power developed with gas alone is lower than that obtained with gasoline. (4) The CO content of the exhaust gases is considerably less with town's gas as a fuel than in the case of gasoline. (5) Gas is more responsive to supercharging than gasoline, the power output being increased to a greater extent. In the tests with supercharging, the thermal efficiency was only decreased by 0.25% on town's gas, compared with 6.45% on gasoline. (6) The thermal efficiency obtained with town's gas would be further improved by increasing the compression ratio. (7) The performance of the engine is much improved by saturating the gas with benzine or benzol, the amount of the benzine required being about ¾ gal./1000 ft.^{3} of gas. MAB (23)

The Use of Gas as a Fuel in Industry. *Gas World,* Vol. 97, July 16, 1932, Industrial Gas Supplement, pages 9-10.

The article consists of written contributions to the discussion on C. M. Walter's paper, presented at the annual meeting of the Institution of Gas Engineers (see preceding abstract). P. Lloyd discussed the concept of furnace efficiency; C. S. Shapley, the question of fuel cost; H. J. Toogood, the cheapest British fuel; Walter replied to all these discussions. MAB (23)

Recent Developments in Gas Burners. Part IV. W. Trinks. *Heat Treating & Forging,* Vol. 18, May 1932, pages 319-320, 322; *Blast Furnace & Steel Plant,* Vol. 20, May 1932, pages 436-438.

Discusses the design of luminous-flame burners. MS (23)

Progress in the Industrial Application of Gas. (Fortschritte der industriellen Gasverwendung.) Otto Wolff. *Gas und Wasserfach,* Vol. 75, July 30, 1932, pages 617-623.

Paper read before the 73rd annual meeting of the Deutscher Verein von Gas und Wasserfachmännern, May 30, 1932, at Essen. The manifold applications of gas for heating purposes in the ferrous and non-ferrous industry are presented in detail and the recent increase in the thermal efficiency of gas heated furnaces is shown. Some new types of furnaces, such as a bright annealing furnace, system Prüfert, rotating soldering furnaces, etc., are described. The efficiency of gas heating is illustrated in the case of a crucible melting plant for brass and bronze. 5 references. GN (23)

Furnace Chamber Studies of a 200-ton Open-hearth Furnace Heated with Mixed Gas. (Kammer Untersuchungen an einem mit Mischgas Beheizten 200-t-Siemens-Martin-Ofen.) Kurt Hübner. *Archiv für das Eisenhüttenwesen,* Vol. 5, June 1932, pages 591-601.

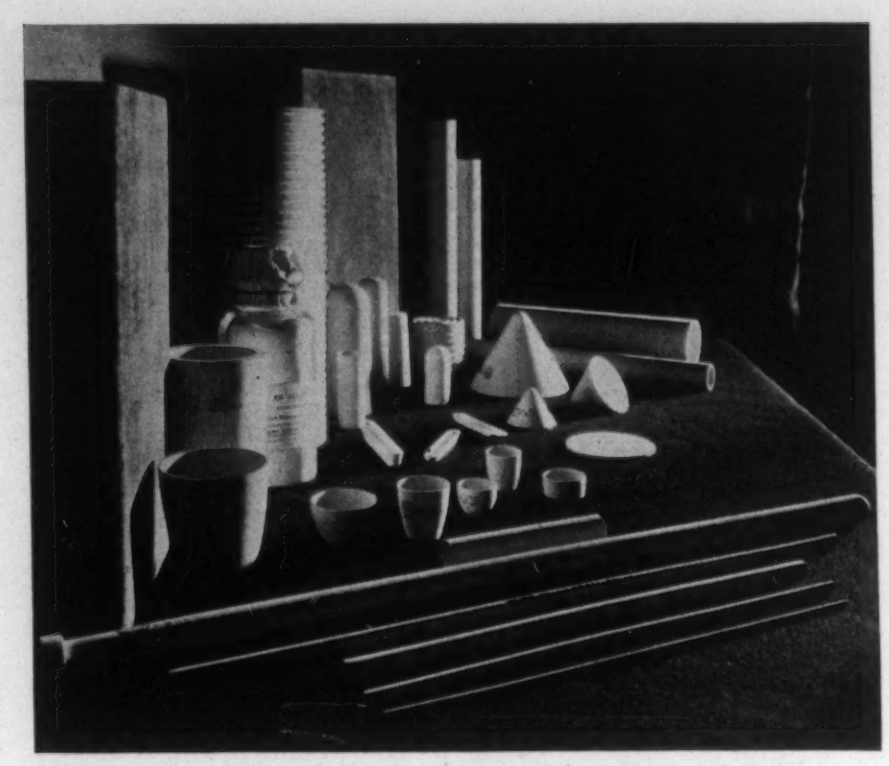
Report 229 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion, 14 references and 11 tables of data. A 200-ton open-hearth tilting furnace fired with a mixture of coke-oven and blast-furnace gas was studied as to pressure loss, flue gas distribution, leakage air admission, heat loss and preheating, with a heat balance both for gas and air chambers and ducts. Average analyses are given of fuel, combustion, air chamber, gas chamber, and flue gases. The use of an insulating material "Sterchamol" for improving heat efficiency gave good results for the gas chamber but the air chamber walls, arch and ducts require no costly Sterchamol insulation. The design of the air and gas chambers was made in accordance with specifications of an experimental chamber at the Ruhrort-Meiderich Works. Good practice in construction of regenerator chambers of open-hearth units using mixed gas fuel is discussed thoroughly. DTR (23)

Efficient Forge Furnace. C. Foster Clark. *Heat Treating & Forging,* Vol. 18, June 1932, pages 371-372.

A conventional type furnace has gas burners placed 2 to a side and inclined so that their axes are practically tangential to the arch. Center line of burners on one side is placed 3″ below center line of opposite burners. Center lines of burners are staggered in the horizontal plane also. Tunnel-type burners with alloy tips are used. Burner nearest the slot on each side is drilled with a 1″ nozzle, while rear burners are drilled ⅞″. A low-pressure inspirator supplies each pair of burners with mixture of air and gas. A flue is built on each side in such a way that gases are drawn from the level of the hearth rather than from the arch. Furnace is equipped with a motor-driven temperature-control valve. Furnace is designed to heat about 300 lb./hr. of ⅞″ round and square sections of a special steel similar to SAE 1015. At maximum capacity, 130 lb. of steel are heated/ft.^{2} hearth area/hour. In regular production work, it has averaged 3.3 ft.^{3} of 530 B.t.u. gas/lb. stock. It has increased production 25% above that of oil-fired furnaces of the same size operating on the same material. Life of forging dies has been increased about 40%, burnt stock has been eliminated, there is quicker heating from cold, and uniformity of heat. In 2 years, the only maintenance work has been the replacement of about 1/3 of the lining. A slightly oxidizing atmosphere is maintained. MS (23)

Advancements in Industrial Furnace Construction. (Neuerungen im Industrieofenbau.) *Die Wärme,* Vol. 55, Mar. 26, 1932, pages 214-215.

Some erroneous designs of gas and oil fired industrial furnaces are critically discussed. A single burner muffle furnace of 0.9 × 1.8 × 0.4 m. inside dimensions, and a hardening furnace for high-speed steels are described and illustrated. In these the material does not come in contact with the flame; the furnace roof and walls reverberate the heat and heat the charge by radiation. EF (23)



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ORE CONCENTRATION (33)

Concentration of the Rake Discharge from a Bowl Classifier in a Washing Plant of the Mesabi Range, Minnesota. FRED D. DEVANEY & WILL H. COGHILL. *United States Bureau of Mines, Report of Investigations* No. 3148, Apr. 1932, 7 pages.

Fines from ores of the jigging type are readily concentratable by classification and tabling. Bowl rake products containing 14-20% SiO_2 are even more amenable to treatment. From such material a large % of the Fe can be recovered direct from the first spigots of a classifier; only the later spigots require tabling. From rake products containing 20% of SiO_2, approximately 45% would be recoverable as classifier concentrates; at the overflow end 5% can be discarded, leaving 50% to be tabled. From a table feed assaying Fe 44.40%, insoluble 34.50%, and SiO_2 33.68%, concentrate was produced assaying Fe 62.98%, in soluble 9.00%, and SiO_2 8.00% and a tailing of Fe 21.32%, insoluble 67.42%, and SiO_2 65.15%. The concentrate carried 79.78% of the total Fe and the tailing 84.17% of the insoluble. AHE (33)

Methods and Costs of Concentrating Scheelite Ore at the Silver Dike Mill, Mineral County, Nevada. WILLIAM O. VANDERBURG. *United States Bureau of Mines, Information Circular* No. 6604, Apr. 1932, 12 pages.

An ore containing 1% of scheelite is tabled. The concentrates are roasted and then cleaned magnetically to give a final concentrate containing 70-75% WO_3 with an 80-81% recovery at a total direct cost (details given) of $2.649/ton of ore. Flotation experiments using in roughing pine oil 0.12 lb., oleic acid 0.16 lb., Na oleate 0.40 lb. and Na_2CO_3 0.75 lb. and in cleaning Na_2CO_3 0.75 lb. and Na silicate 0.40 lb./ton of ore gave a concentrate (3.4%), middling (21.7%) and tailing (74.9%) assaying 62.72%, 1.03% and 0.03% WO_3, respectively, for recoveries of 89.7%, 9.4%, 0.9% of the WO_3 in the 3 fractions. Concentrates up to 79% WO_3 have been obtained at only slightly less recovery. AHE (33)

Progress in Metal Mining in Manitoba. GEORGE E. COLE (Director of Mines, Manitoba). *Canadian Mining & Metallurgical Bulletin* No. 238, Feb. 1932, pages 39-57.

Flotation, cyanidation, leaching and Cu smelting at Flin Flon and milling methods at Sherritt Gordon are described. AHE (33)

Flotation (33c)

Milling Methods at the Concentrator of the Walker Mining Co., Walkermine, California. M. R. MCKENZIE & H. K. LANCASTER. *United States Bureau of Mines, Information Circular* No. 6555, Mar. 1932, 11 pages.

A Au- and Ag-bearing chalcopyrite-magnetite-quartz ore assaying (average for 6 mo., 1930) Cu 1.687%, Fe 9.0%, S 2.1%, CaO 1.1%, insoluble 79.2%, Au 0.05 oz. and Ag 0.833 oz./ton is concentrated by flotation to give concentrates (6.41%) assaying Cu 24.00%, Fe 22.1%, insoluble 14.5%, Au 0.49 oz. and Ag 9.920 oz./ton and tailings (93.59%) containing Cu 0.163%, Fe 8.1%, insoluble 83.5%, Au 0.02 oz. and Ag 0.200 oz./ton. Recoveries were Cu 91.2%, Au 62.7%, and Ag 73.3%; the tailings carry 98.8% of the insoluble. Consumption of flotation reagents was lime 1.40 lbs., pine oil 0.321 lb., K eethyl xanthate 0.084 lb. and Na aerofloat 0.075 lb./ton of ore. AHE (33c)

Flotation Tests on Lead-Silver Ore from the Mallard Lake Gold Mines, Ltd., Kirkland Lake, Ontario. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 3-4.

A low-grade Pb-Ag ore of chalcopyrite and sphalerite in calcite and assaying Au 0.02 oz. and Ag 6.40 oz./ton., Pb 5.70%, Cu 0.47% and Zn 0.49% gave recoveries by flotation of Pb 97% and Ag 94% in a concentrate assaying Pb 65%, Cu 4.81%, Zn 2.13%, Ag 68 oz. and Au 0.15 oz./ton using soda ash, cyanide, thiocarbanilide and pine oil. AHE (33c)

Salts in Tri-State Mill Waters: Their Ill-Effect on the Flotation of Blende and Their Removal. A. B. CAMPBELL, WARREN HOWES & W. H. ODE. *United States Bureau of Mines, Report of Investigations* 3149, Mar. 1932, 24 pages.

The use of acid mine waters for milling purposes in the Tri-State Zn district of Mo., Kan., and Okla. has resulted in corrosion of mill equipment and difficulties in the flotation operations. The acid waters were most abundant in the eastern part of the Picher district, where carbonates were absent in the ore bodies. If carbonates, chiefly calcite, were found in the tailings piles the waters did not contain enough acid or metallic salts to cause trouble. Analyses of the troublesome waters sometimes showed more than 5000 p.p.m. of free acid and of dissolved salts in the form of sulphates. The principal corrosive agents are free acid and $Fe_2(SO_4)_3$. The principal flotation toxic is $FeSO_4$; $ZnSO_4$ requires minor consideration. Appreciable quantities of the sulphates of Ca and Mg caused little or no trouble. The most satisfactory treatment is the selective removal of the ferrous and ferric Fe and free acid by alternate periods of aeration and neutralization. The aeration oxidizes the ferrous Fe: the neutralization removes free acid and the ferric Fe. Neutralization may be accomplished most cheaply by upward percolation through high-grade limestone: low-grade limestones are ineffective. Bases, such as lime and caustic soda, act more quickly, but their cost is higher. AHE (33c)

The Differential Flotation of Copper and Iron Sulphides in the Ore of the Aldermac Mines, Ltd., Aldermac, Quebec. A. K. ANDERSON, J. S. GODARD & C. S. PARSONS. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 101-110.

An ore of pyrite and pyrrhotite with small amounts of chalcopyrite assaying Cu 1.75%, Fe 28.2%, and S 39.3% was floated easily. To secure maximum recoveries a low-grade rougher concentrate is produced and cleaned. The Cu minerals were sensitive to cyanide; if over 0.04 lb. cyanide per ton is added the Cu is depressed. Recoveries fall off when grinding exceeds 65% solids. Typical results show 93.6% Cu recovery in a rougher concentrate assaying 20.72% Cu and 63.2% of the mill feed recovered as pyrite concentrate assaying 52.2% S using reagents as follows, in lb./ton of ore: ball mill — soda ash 3.7, cyanide 0.035, Aerofloat No. 25 0.06; Cu cells — cresylic acid 0.036; Fe cells — soda ash 2.1, Aerofloat No. 25 0.09, $CuSO_4$ 0.5, K xanthate 0.66. The ball mill discharge was 58% solids. AHE (33c)

Mineral Flotation. A. F. TAGGART. *Journal Physical Chemistry,* Vol. 36, Jan. 1932, pages 130-154.

The mechanism of flotation of sulphide ores is discussed from a physical chemical standpoint. In froth flotation the material removed is lifted by the bubbles, probably at the oil-water interface. Relatively large droplets of Nujol observed under a magnification of 20x to 30x, upon adding a frothing oil, entrained air and a larger quantity of solid was carried probably at the oil-water interface. A useful frothing reagent should lower the surface tension at the air-liquid interface from 3 to 5 dynes/cm. The effectiveness of H_2SO_4 and similar inorganic frothing reagents probably is due to the liberation of organic frothing agents from the film of oil and grease naturally present in the ground ore. The best frothing agents are slightly soluble organic compounds, characterized by a hydrocarbon group of relatively high molecular weight carrying an O_2-bearing polar group. An average of 5.5 C atoms, with the following polar groups (in order of decreasing frequency of occurrence), are good frothers: OH, CO, COOH, CONH, COO and COC, and with solubility around 1000 mg./l. Essential oils with high percentages of terpineol, menthol, eucalyptol, borneol, camphor and the like, are the best frothers. The solid-loaded films in froth flotation are enormously more stable than films produced with the same reagents but with no solids present. Straight hydrocarbon oils serve as "collectors" increasing the amount of solid floated although xanthates are the modern collectors. The action of oils as collectors is based upon the hypothesis that the oil-sulphide interfacial energy is less than that of the water-sulphide interface while for quartz the reverse must be true. In other words, the oil wets the ore. The chemical collectors are characterized by a multi-valent amphoteric element, combined in a low valent or reduced state (hence capable of reacting with the surface of the substance to be floated). A reasonably bulky hydrocarbon portion, 7-8 atoms, is usually necessary. Besides the xanthates, compounds containing the following groups are also effective: amino, amide and thioamide, azo and diazo, sulphide and sulph-hydrate. Besides the frothing and collecting agents conditioning agents must be used. These act in one of 5 ways, viz: (1) By reacting with the surface of the mineral to be floated so as to increase its floating tendency, (2) to decrease the floating tendency of some constituent, (3) to react with and remove some undesirable salt from the solution, (4) to increase the degree of dispersion thus modifying the effect of the slime upon the particles to be floated, (5) to maintain the pH at the proper point. The methods are discussed with a brief classification of the types of machinery used. WHK (33c)

Flotation. (Flotation.) ERWIN W. MAYER & HUBERT SCHRANZ. S. Hirzel, Leipzig, 1931. Cloth, 6 x 9 inches, 593 pages. Price 35 RM.

This book is a comprehensive survey of the art of flotation in its present day status.

Periodical literature, technical society transactions, university research publications, patent literature and trade publications have been covered thoroughly, freely referred to and annotated so as to furnish an up-to-date bibliography of the subject.

The first section of the book covers the definition, description, variations and limitations of flotation together with the history of the art and its general applications supported by world statistics.

The second section deals with ore dressing and flotation equipment, including excellent illustrations and descriptions supported with considerable operating data of equipment in use in present day practice.

The third section discusses modern flotation processes and the theories that have been advanced to explain them; also the control of the process including the influence of slime density, temperature, H ion concentration. Fifty-two pages are devoted to flotation reagents.

A fourth section treats individual applications of simple and selective flotation to an extensive list of ores, also to oxidized ores and minerals including a special section on coal flotation.

Only two pages are devoted to research apparatus which seems rather deplorable in a text otherwise so practical, and particularly in an art which owes much of its development to intensive test work.

Considerable cost data, process data assembled in charts, flowsheets, list of German patents, list of ores, minerals mining and milling terms with corresponding English equivalents and a bibliography of recent important articles on flotation form a valuable appendix. H. Earl Dunn (33c)-B-

Physical Chemistry in Relation to Separation of Ores. JULIUS GRANT. *Crushing & Grinding,* Vol. 1, Mar.-Apr. 1932, pages 134-135.

Principal factors in froth flotation are: (1) surface tension of the medium, (2) size of particle, (3) agitation and the tendencies of the system towards coagulation or adsorption, (4) foreign substances, and (5) pH. Flotation phenomena may be explained electrically. These points are discussed. AHE (33c)

Magnetic Separation (33d)

The Laboratory Concentration of Bell Iron Ore. T. W. HARDY & H. H. BLEAKNEY. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 198-200.

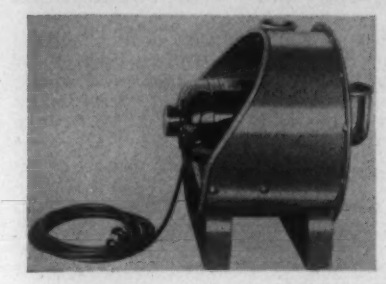
Magnetic concentration rejected 60% of the insoluble at minus 20 mesh and 77% at minus 200 mesh. In commercial practice the sponge Fe should contain 80-85% Fe. AHE (33d)

Theoretical Principles of the Fine-Crushing of Ores. (Theoretische Grundlagen der Feinzerkleinerung von Erzen.) P. ERIMESCO. *Zeitschrift Verein Deutscher Ingenieure,* Vol. 76, Jan. 30, 1932, pages 115-117.

For each kind of concentration there exists an optimum grain size to which the ore must be reduced; this is particularly important for an economic and thorough extraction of poorer ores as they have to be worked today after exhaustion of rich deposits. The physical foundations of the methods for crushing are discussed, crushing resistance and a scale to measure it are explained. The machines used at present do not yet conform to scientific operation; the author recommends more detailed study of the process. 5 references. Ha (33e)

New Equipment and Materials

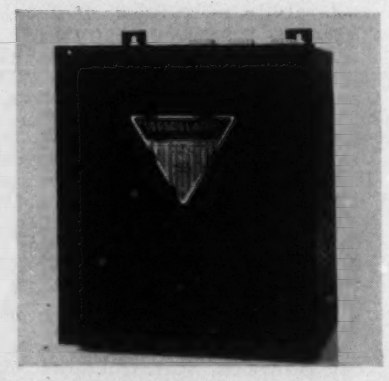
Small Turbo Air Compressor



The smallest multi-stage centrifugal compressor ever built for commercial purposes by the Spencer Turbine Company of Hartford, Conn., is now in standard production. This unit is self-contained, and will deliver 75 cu. ft. of air per minute at 12 oz. pressure. It is 12 in. in diameter and weighs 40 lbs. The motor is 1/3 H.P. a.c. or d.c. This Spencer Turbo Compressor is used for individual operation of all forms of heat treating equipment, gas boosters and other devices requiring low pressure air.

Metals & Alloys, April 1933.

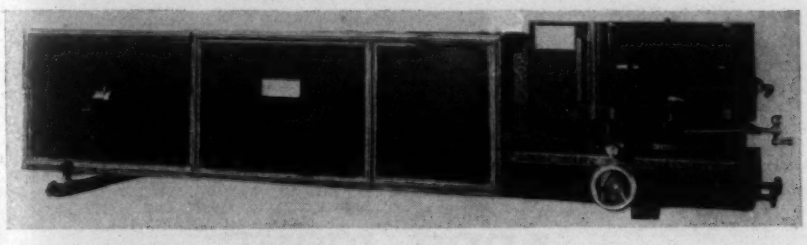
Temperature Control Device



"Anticipatory" control action may be obtained with any pyrometer controller, it is said, by adding a new auxiliary device developed by the Foxboro Company of Foxboro, Mass. This action is said to eliminate hunting or over-controlling. The Deoscillator is cut-in between the thermocouple and the controller. In operation, the instrument impresses into the thermocouple circuit a slight additional e. m. f. that augments the thermocouple e. m. f. when the temperature is low and opposes it when the temperature is high. This causes the controller to close either the high or low circuit a little ahead of the actual temperature demand. The effect prevents excessive overrun or underrun. Adjustment to the requirements of the particular heating equipment on which the Deoscillator is installed is quickly made. Once the instrument is set correctly, that setting will hold for practically any condition from no load to full load.

Metals & Alloys, April 1933.

Large Littrow Spectrograph



The new Bausch & Lomb Optical Co. Littrow type spectrograph was intended for the analysis of materials yielding extremely complicated spectra. It was necessary to build an instrument of large size, in order to secure the necessary separation of lines on the photographic plate, so that even the most complex spectra are effectively resolved and dispersed. This permits accurate work, both qualitative and quantitative, with alloy steel, tungsten carbide alloys, stellite and other materials yielding spectra in which the lines are crowded together.

Its characteristic feature is the use of a reflecting surface on the back of the prism to reflect the dispersed light back through the prism and lens, the latter serving both to collimate the entering light and to focus dispersed spectrum on the photographic plate. This makes it possible to build an instrument half the length necessary to get an equivalent distance between the slit and the photographic plate and requires but half the amount of expensive optical quartz. This spectrograph is of heavy, rugged construction to insure rigidity and permanence of alignment and adjustment.

A glass optical system is available, interchangeable with the quartz, which gives a still wider separation of lines between 3550 and 8000 A.U. It will be found particularly useful for studies in the visual portion of the spectrum, in which lie the most important lines of the alkalies, the alkaline earths and a few other elements. This portion of the spectrum will cover 2 ten inch plates.

A complete series of adjustments permits change in slit width, slit length, position of the spectrum on the plate, angle of the plate with the light beam, etc.

The entire mechanism, of unusually large proportion, is enclosed in a case of sheet metal. This large size has been found to be the most effective means of providing for the deflection and absorption of stray reflected light, insuring clean plates free from the fog and light streaks.

Metals & Alloys, April 1933.

Testing Machine Recorder Controller

Several devices, distinct from one another and associated for the purpose for the first time, provide in alternative combinations (1) an autographic stress-strain recorder which produces a graph up to incipient failure, or which may, by adaptation, produce a graph to and through failure on metal, wood or any other material; (2) an instrument which is all of (1) and in addition controls load application to effect constant rate of strain increment, constant rate of load increase and load maintenance at constant value. The new apparatus, brought out by Baldwin Southwark Corp., Philadelphia, Pa., in no way limits manual control; such control is inherent up to any predetermined point at which the instrument takes over the control function and proceeds to exercise it to a point elected by the operator. The devices are combinations of (1) extensometers, (2) Bourdon tube, and (3) hydraulic valves in association with motors, relays, solenoids and mechanical clutches. The extensometer or strain gage is fundamentally a micrometer screw in combination with a mechanical lever multiplying system. (See Fig. 1.) It is not primarily an indicating instrument, but a relay—a link between the varying gage length and the recording pencil. As the specimen extends (or contracts) an electrical circuit is broken. The recorder proceeds at once to re-establish the circuit by turning the micrometer screw until a new contact is made. Action at once ceases. But this effort of the recorder to re-establish a broken circuit serves as the means of moving the recorder pencil by the proper amount to record the strain variation. The sensitivity is to 0.00002 in. strain. The accuracy is ± 0.00005 in.

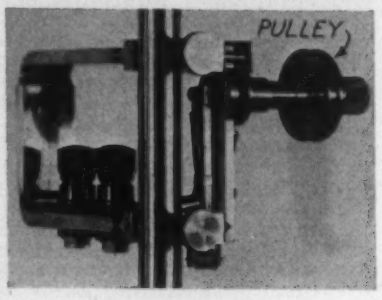


Fig. 1

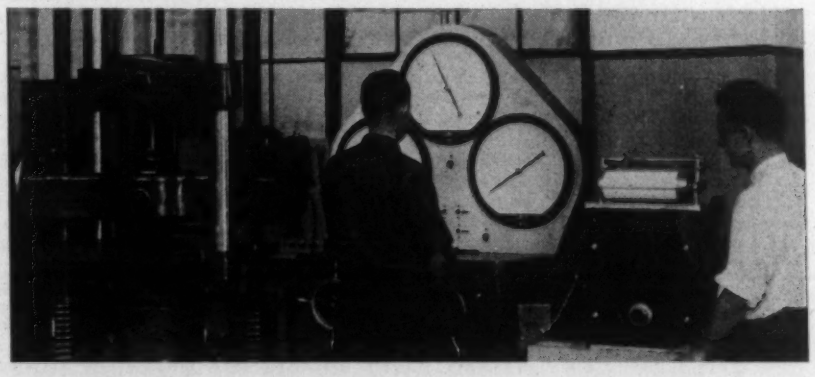


Fig. 2

A precision Bourdon tube pressure-measuring element, incorporated in the stress-strain recorder-controller (Fig. 2), operates a light metallic arm on the end of which is a coiled nickel wire having a "cat whisker" making light contact with silver segments. The circuit thus opened and closed (without affecting the Bourdon tube) includes a sensitive relay which controls the mechanism for rotating the recording drum (which carries the graph paper) in strict proportion to the movement of the arm, which movement, in turn, is in strict proportion to the load on the specimen under test. Through a similar relay method, the recording pencil is positively driven in strict proportion to the variation in strain. Multiplication ratios of as much as 2000 may be had. It is found, however, that a multiplication ratio of 250 to 750 provides greater all-around satisfaction. These parts are essentially those of the recorder alone. They also are integral parts of the recorder-controller which not only makes a record but also controls the *time-rate* of application of stress or strain at the command of the operator. 12 speeds are available: 6 on an inches-per-minute basis and 6 on an inches-per-hour basis. (In other terms, speeds from 0.0001 in. per inch gage length per hour to 0.002 in. per inch gage length per minute.) The number of steps may be indefinitely extended by the multiplication of sets of change gears. The *strain* in the specimen (which means movement of the ram in the load-production cylinder of the testing machine is controlled as to time-rate by the quantity of fluid admitted to this cylinder. In like manner, an auxiliary disk is driven by a synchronous motor at various desired velocities and contacts serve to control the time-rate of *stress* application. Speeds of stress application to one-half the capacity of the testing machine per minute are available. In both rate-of-strain and rate-of-stress control, slippage of the specimen in the grips, of the grips in the heads of the testing machines, and strain outside the gage length of the specimen, have no effect on the controlled rate of strain or stress application. It is possible, also, to produce strain-time or stress-time graphs by availing of the synchronous motor motions. The devices represent a step forward in the field of materials testing for it has never before been possible to control automatically and within narrow limits, rates of strain and stress application. With some non-ferrous materials, these rates are of vital importance in the interpretation of test results.

Metals & Alloys, April 1933.

MANUFACTURERS' LITERATURE REVIEWS

68 **Beryllium Copper**—A most attractive booklet has recently been published by the Riverside Metal Co., Riverside, N. J., which presents briefly general information on Beryllium Copper, its composition, general properties, heat treatment and gives a number of suggested applications for this alloy.

69 **Non-Ferrous Spekker**—Adam Hilger, Ltd., London, England, have published a pamphlet describing their spectroscope for the rapid estimation of metallic elements in non-ferrous metals. Directions for its use are given. Publication No. 173/2 of the same company discusses their X-ray metallurgical crystallograph for the X-ray examination of the effects of heat and mechanical treatment on metals.

70 **Optical Instruments**—Catalog L-1 of the Gaertner Scientific Corporation, Chicago, Ill., illustrates and describes their spectroscopic instruments and accessories.

71 **Nickel Cast Iron Data**—The International Nickel Company, New York, N. Y., has published a data sheet designed as a convenient and quick source from which suitable nickel and nickel-chromium cast iron compositions may be selected for specification purposes. Supplementary sheets devoted to specific applications, such as dies, brake drums, grate bars, etc., will be issued.

72 **Saving on Carboloy Tools**—In a folder recently issued by the Carboloy Co., Detroit, Mich., the suggestion is made that the user purchase his Carboloy tools "milled and brazed" and so effect a substantial saving on every order. The only difference between "milled and brazed" tools and regular finished tools is that they have not been ground.

73 **Relays for Laboratory and Industrial Use**—A 4-page bulletin on supersensitive, mercury, mechanical and photoelectric relays for a wide variety of control applications has recently been issued as Bulletin No. 1001 by the American Instrument Co., Washington, D. C.

74 **"The Laboratory"**—A recent issue of this publication of the Fisher Scientific Co., Pittsburgh, Pa., features an interesting article on The Evolution of Weights. A new burette holder is described in a brief article and a new acoustimeter is illustrated.

75 **X-Ray of Code Welds**—The Kelley-Koett Mfg. Co., Covington, Ky., is distributing reprints of an article by this title which describes the X-ray examination of welds for areas of incomplete fusion, gas pockets, slag inclusions, etc.

76 **Welding Electrodes**—The Bannar Welding Supply Co., 156 Main St., Buffalo, N. Y., has sent out a leaflet describing the Nico welding electrodes distributed by them. Mention is also made of their copper-arc electrodes and suggestions are given for welding cast iron having excessive free carbon.

77 **Midget Air Grinder**—A new air grinder, small enough to be concealed in the palm of the hand, yet having a tested grinding speed of 40,000 revolutions per minute has just been announced by the Madison-Kipp Corporation, Madison, Wis. The line contains models for every service requiring wheels up to 1½" in diameter.

78 **Carborundum**—The Carborundum Co., Niagara Falls, N. Y., has prepared an attractive booklet entitled "Products of the Carborundum Company that Serve the Steel Industry." It describes their Aloxite Brand Redmanol Wheel for foundry grinding, their "Green Grit" wheels for grinding tungsten carbide, their Aloxite "TP" polishing grain and their "Carbofrax" hearths.

79 **Darkfield Microscopy**—Bulletin No. 4 of E. Leitz, Inc., 60 East 10th St., New York N. Y., discusses briefly their darkfield microscopy for micro analysis of metals. Several micrograms in darkfield and brightfield are reproduced and contrasted.

80 **Alloy Steels**—A series of leaflets has been issued by the Wheelock, Lovejoy & Co., Inc., New York, N. Y., each leaflet being devoted to a particular analysis of alloy steel. The physical properties, heat treatment, composition and outstanding characteristics of each are given. The leaflets are punched for filing in a pocket notebook.

81 **Moisture Tester**—A leaflet devoted to the "Speedy" Moisture Tester marketed by them has been issued by the Alpha-Lux Co., Inc., New York, N. Y. Its use in the testing of molding sand is emphasized, though it can be used for coal, coke, abrasives, paper, cotton, grain, etc., as well.

82 **Nichrome**—Booklet R-28 of the Driver-Harris Co., Harrison, N. J., contains data and specifications pertaining to alloys for electrical resistance with detailed discussion of Nichrome, for use in heating devices operating up to 900° C. (1652° F.), and Nichrome IV, which resists oxidation at temperatures up to 1150° C. (2102° F.).

83 **Metallic Zinc Paint**—A booklet recently issued by the American Zinc Institute, New York, N. Y., stresses the use of metallic zinc paint for the protection of metal surfaces against corrosion. The composition, manufacture and properties of this paint are given, together with suggestions for its use.

84 **Desulphurizing Cast Iron**—The Mathieson Alkali Works, New York, N. Y., is distributing rotoprint copies of "Desulphurizing Cast Iron—An Outline of the Different Methods of Refining Cupola Metal with Purite" which was prepared by George S. Evans, metallurgist. It is a complete and detailed discussion of the process.

85 **Projection Welding**—A new folder of P. R. Mallory & Co., Indianapolis, Ind., entitled "New Light for Old," describes their alloy of copper and tungsten "Elkonite" in relation to projection welding, a new process by which many welds can be made at one operation. Their folder "Mushrooms" is devoted to their water-cooled holders and "Elkonite" as an electrode die material.

86 **Carburizing Compound**—A booklet prepared by the Char Products Co., Merchants Bank Building, Indianapolis, Ind., describes their case hardening material which is said to effect great economies in the carburizing of steel. It is manufactured in three types to meet individual requirements.

87 **The Romance of Electrical Contacts**—A 42-page book sent out by P. R. Mallory & Co., 350 Madison Ave., New York, N. Y., describes the development of their platinum, tungsten and silver contacts. A chapter is devoted to the sizes of the various forms of contact points.

88 **The Zinc Alloy Pot**—The second issue of this publication of the New Jersey Zinc Co., New York, N. Y., contains a summary of the analysis of the answers received from a nation-wide questionnaire covering the status and trend in metal product development. There is also a cost analysis of machined castings vs. die castings and a table of casting limits for various alloys.

89 **Welding**—An attractive little 36-page book entitled "The Romance of Resistance Welding" has been issued by Elkon, Inc., Division of P. R. Mallory & Co., Indianapolis, Ind. It describes the early development of Elkonite and its applications at present. A folder sent out by the same company called "A Miss is as Bad as a Mile" describes their water-cooled welding tips.

90 **Atmosphere Furnaces**—A recent circular sent out by the Surface Combustion Corporation, Toledo, Ohio, gives performance data on their atmosphere furnaces which have been compiled from installations in actual production on bright annealing, carburizing and nitriding.

91 **Welded Tubing**—The Carpenter Steel Co., 100 Broadway, New York, N. Y., has issued a leaflet which gives the physical properties and working instructions for their stainless welded tubing.

92 **Electric Furnaces**—Bulletin No. 280 of H. O. Swoboda, Inc., Pittsburgh, Pa., shows diagrams and illustrations of the "Falcon" electric heat treating equipment. The layout for a complete hardening and tempering installation is given.

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CURRENT

METALLURGICAL ABSTRACTS

A digest of the important metallurgical developments of the world

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GENERAL (0)

Journal of the Institute of Metals, Proceedings. Vol. 48, No. 1, 1932. Cloth, 5½ x 8½ inches, 350 pages.

This volume contains the minutes of the 24th annual general meeting of the Institute held in March 1932, together with the papers read at that meeting and the discussion. These papers have been abstracted individually in *Metals & Alloys.* M. L. Moorman (0)-B-

General Engineering Handbook. C. E. O'ROURKE. McGraw-Hill Book Co., New York, 1932. Cloth, 5 x 8 inches, 921 pages. Price $4.00.

This is an attempt to summarize fundamental data for all branches of engineering into one handbook.

The metallurgical aspects of the book would have been improved had the long list of assistant editors included a metallurgist. Endurance properties get no direct mention, though a few tables copied from H. F. Moore include endurance data. Nothing is said about the effect of notches. Not only are nitriding and chromium plating not mentioned, but the reference to carburizing would not indicate to the reader what case carburizing is good for.

High test cast iron is barely mentioned. Nickel iron is included, but the reader would assume that it was always used alone, without chromium and that there were no other alloying elements available. Alloy steel is nearly as poorly treated. High speed steel is not mentioned, to say nothing of tungsten carbide. Machining and machinability are evidently considered not fundamental in engineering.

The discussion on bearing metals is not of much metallurgical moment.

It is stated in sec. 28, written by a professor at M. I. T., that a thermocouple of 90% platinum 10% *rubidium* is suitable up to 1500° C.

The section on welding is about the only one in which any symptom of real metallurgical knowledge is indicated.

The book is written by civil engineers and is a civil engineering handbook plus a little more, but the little more includes a vanishingly small amount of metallurgical information. H. W. Gillett (0)-B-

Replacing Metals by Synthetic Resins—Phenol-Resinoid Molding Technique. LEON V. QUIGLEY. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, *Machine Shop Practice,* pages 17-28.

The mechanical properties of synthetic resins with a phenol base are described and their suitability for replacing metals discussed. The many fields in engineering practice where they are employed are illustrated. Ha (0)

Metallography and Its Place in Industry. J. R. MILLER. *Heat Treating & Forging,* Vol. 18, Jan. 1932, pages 57-60.

Points out that the metallographist should be exceptionally well grounded in all branches of metallurgy and in chemistry and physics, and should have an intimate familiarity with technique. Discusses briefly some methods which may be used in the future. Counsels against premature application of unfinished theories to practical inspection work. Reports of research work should contain complete information. MS (0)

Definition of Dividing Line Between Steels and Cast Irons. A. L. NORBURY. *Metallurgist,* Jan. 1932, page 16.

A letter to the editor in which the following definitions for cast irons and steels are advocated. "——— cast irons are those Fe-C alloys which contain carbide eutectic, or graphite eutectic, in the as-cast condition, while steels are those which do not contain such eutectic." In the Feb. 1932, issue of the *Metallurgist,* pages 17-18, this letter is discussed to the effect that under modern conditions a satisfactory line of demarkation between steel and cast Fe is not feasible if the definitions involved are to be strictly applicable to all cases. For the broad distinctions which apply to most uses of these terms, the generally understood meanings attached to them are no doubt sufficient. Where exact or more or less legal terminology is needed, the *Metallurgist* suggests that specification of the nature and range of the material involved in each case should be employed in place of such general terms as "cast iron" and "steel." VVK (0)

Coöperative Research in the Iron & Steel Industry. F. N. SPELLER. *Year Book of the American Iron & Steel Institute.* 1931. pages 48-79.

See *Metals & Alloys,* Vol. 2, Sept. 1931, page 159. (0)

The Theory of Metallurgical Processes. CH. K. AVETISSIAN. *Tzvetnuie Metallui,* Oct. 1931, pages 1311-1329.

A theoretical discussion of methods of investigation of metallurgical processes and the application of thermodynamics to the study of steel making and Cu smelting processes. BND (0)

Some Principles of Testing. W. ROSENHAIN. *Metallurgist,* Apr. 1932, pages 57-58; May 1932, pages 71-72.

Testing of metals and alloys should be the testing of the true physical constants. Our knowledge of the behavior of metals under stress is not sufficient to permit of more than an approximation or compromise. Metals are therefore tested under service conditions and, from the information gained, we can endeavor to determine these constants. Ideal fundamental considerations must be kept in the forefront. VVK (0)

Teaching and Research in the Foundry Institute of the Technical University of Aachen. (Lehre und Forschung im Giessereiinstitut der Technischen Hochschule zu Aachen.) E. PIWOWARSKY. *Die Giesserei,* Vol. 19, July 8, 1932, pages 262-269.

An exhaustive review of the work done during the last 4 years in the fields of cast Fe, hard castings, malleable Fe, steel castings and non-ferrous metal casting. Many diagrams represent the behavior of the metals. 35 references. Ha (0)

Utilizing the Testing of Materials for Construction. (Die Nutzbarmachung der Werkstofforschung für die Konstruktion.) E. LEHR. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 333-337.

Emphasizes the importance of intelligent engineering interpretation of test results. Unless the test exactly duplicates service, a factor of safety is required. HWG (0)

The National Physical Laboratory. *Engineering,* Vol. 134, Aug. 12, 1932, pages 190-192.

A summary of the various metallurgical investigations recently carried out at the Laboratory. Research has been along the following lines: X-ray analysis, high-purity metals, refractories; analysis of steel and cast Fe, standard samples; Al, Mg, Be; materials for use at high temperatures; alloys of Fe, impurities in Cu, dental amalgams; viscosity. LFM (0)

Process Control and Removal of Defects by Means of Large Scale Research. (Betriebsüberwachung und Fehlerbeseitigung durch Grosszahl-Forschung.) KARL DAEVES. *Stahl und Eisen,* Vol. 52, July 28, 1932, pages 725-729.

Report 183 of Committee on Materials of Verein deutscher Eisenhüttenleute. A general discussion of the value of research work on process control and uniformity of production. For any industry the writer suggests the use of frequency curves in each phase of production. These frequency curves may tell at a glance just what difficulties are to be expected, the magnitude of each defect, and naturally which defect is most likely to be controlled or eliminated. Relations may be derived also between measurable factors in production and good production or scrap. In industrial research it is not alone sufficient to use a definite, statistical, physical or chemical method. It is also highly desirable to apply all other methods for a problem in order to arrive at economy and improvement in process and material. DTR (0)

Steel and Its Practical Applications. WILLIAM BARR & A. J. K. HONEYMAN. Blackie & Son, Ltd., Glasgow, 1932. Cloth 5¼ x 7½ inches, 125 pages. Price 6s.

A very elementary treatise in 13 chapters. The general character of the subject matter and treatment is indicated by the following discussion of a few chapters. Chap. I, "The Preparation of Specimens of Iron and Steel for Microscopic Examination," uses only 6 pages to cover this whole subject. In Chap. II, "The Testing of Iron and Steel," the subjects covered include definitions, testing equipment, specimens, various kinds of tests, even fatigue tests, and all of this is done in 14 pages. Similarly "The Manufacture of Steel" is covered in Chap. V in 14 pages, and "Alloy Steels" has been given a like amount of space.

The text is illustrated with 101 figures, many of which are well chosen macrographs and photomicrographs. There are few references in the text, and these are all to books. This publication might be of some use as a first book on the subject and might help the practical worker who has not had technical training, but will be of little use to metallurgists. Oscar E. Harder (0)-B-

PROPERTIES OF METALS (1)

The Elastic Anisotropy of Iron. (Ueber die elastische Anisotropie des Eisen.) E. Goens & E. Schmid. *Mitteilungen der deutschen Materialprüfungsanstalten,* 1932, No. 12, page 182 (abstract). See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 340. HWG (1)

The Properties of Copper in Relation to Low Stresses. The Effect of Cold-Work, Heat-Treatment and Composition. Part I. Tensile and Compression Tests under Short-Time Loading. O. F. Hudson & J. McKeown. *Journal Institute of Metals,* Vol. 48, 1932, pages 69-89; *Engineering,* Vol. 133, Mar. 11, 1932, pages 310-311. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 288. LFM (1)

Conduction of Electricity and Heat in Crystals of Zinc and Cadmium. (Elektrizitäts- und Wärmeleitung in Zink- und Kadmiumkristallen.) E. Goens & E. Grueneisen. *Annalen der Physik,* Series 5, Vol. 14, July 1932, pages 164-180.

Zn and Cd show in the 2 principal directions the accelerated increase of heat conductivity at low temperatures as has been observed in regular metals. The tests are discussed in detail. Ha (1)

Electric Conductivity and Structure of Thin Metal Layers. II. Functional Relations Between Specific Resistance and Thickness of Layer. III. Specific Resistance and Structure as Function of Temperature. IV. A Few Applications. (Zur Elektrizitätsleitung und Struktur dünner Metallschichten. II. Funktionelle Beziehungen zwischen spezifischem Widerstand und Schichtdicke. III. Spezifischer Widerstand und Struktur als Funktion der Temperatur. IV. Einige Anwendungen.) L. Hamburger. *Annalen der Physik,* Series 5, Vol. 10, 1931, pages 789-824, 905-926; Vol. 11, 1931, pages 40-52.

Mathematical relations are found for the correlation of electric conductivity of metals in very thin layers and temperature, especially low temperatures, and structure. A few applications of the discussions are made for some structural and chemical conditions of metals. For details the paper must be referred to. 138 references. Ha (1)

The Preparation of Some Rare Metals by Thermal Dissociation. (La Préparation de Quelques Métaux Rares par Dissociation Thermique.) A. E. van Arkel. *Revue Universelle des Mines,* Series 8, Vol. 8, July 15, 1932, pages 37-41.

The fact that traces of impurities change the electrical and mechanical properties of metals has caused the author to try to develop methods for the production of absolutely pure metals; he assumes that the easily oxidizable metals Zr, Ti, U, are always covered with thin oxide films which hide the nature of the metals and make them brittle. He succeeded in preparing absolutely pure W, V, B and Ti in a vacuum by a special method and obtained ductile wires. The experiments and some of the properties of the pure materials are described. Ha (1)

Thermal and Electrical Conductivities and Wiedemann-Franz Law of Magnesium and Its Alloys. R. Kikuchi. *Kinzoku no Kenkyu,* Japan, June 1932, pages 239-243.

The thermal and electrical conductivities of Mg decrease with the amount of other elements added. The order of the amount of the decrease is as follows: Al, Sn, Zn, Ag, Ni, Cu. The thermal conductivity of Mg containing 12% Al is ¼ as large as that of pure Mg. Both conductivities change with each other, but their ratio is not a constant as shown by the Wiedemann-Franz law. The ratio in the Mg alloys containing Al or Sn is larger than that of pure Mg but smaller in alloys containing Ag, Zn, Cu and Ni. KT (1)

Researches on Beryllium. H. A. Sloman. *Institute of Metals, Advance Copy* No. 616, Sept. 1932, 24 pages.

The brittleness of Be was found to be due to a Be-BeO eutectic surrounding the metal grains. The microconstituents of impure Be were identified and their characteristic appearance described. A series of experiments was directed towards the production of Be sufficiently pure to be malleable. Electrolytically deposited Be and cast sections contained too much BeO to be malleable. Thin films of more than 99.9% purity were produced by distillation in a vacuum. Hardness tests indicated that these films were malleable and had a Brinell hardness between 55 and 60. BeO crucibles were the most satisfactory for melting Be, but they, like other materials, introduced O into the melt. A method for plating Be on other metals in a fused electrolyte at 600° C. was developed. Some evidence for allotropic transformation near room temperature was obtained. Extra lines were found in an X-ray diffraction pattern of a sample of Be cast 3 years ago. 7 references. JLG (1)

The Rhenium Atom. William F. Meggers. *Scientific Monthly,* Vol. 32, May 1931, pages 475-477.

Description of how it was found by the requirements of the periodic law and the corroboration by X-ray spectrographic examination. Ha (1)

Beryllium. J. Becker. *Electrical Review,* Vol. 110, May 6, 1932, page 668.

Condensed from *Engineering Progress,* Oct. 1931. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 55. MS (1)

Magnesium. (Le Magnesium.) A. Dumas. *Revue de l'Aluminium,* Vol. 8, No. 44, 1931, pages 1477-1484.

An account is given of the sources, extraction, methods of manufacture and refining of Mg. See *Metals & Alloys,* Vol. 3, July 1932, page MA 195. Ha (1)

Electrical Properties of Metals in Thin Layers prepared by Thermal and Cathodic Deposition. II. (Proprietes Electriques des Metaux en Couches Minces prepare par Projection Thermique et Cathodique. II.) F. Joliot. *Annales de physique,* Series 10, Vol. 15, 1931, pages 437-454.

The analogous electrical properties of thin films prepared by thermal or cathodic deposition indicate similarity in crystalline structure. When the films are heated the resistance increases regularly and reversibly up to a definite temperature range above which there is an irreversible decrease. This property is probably due to recrystallization of the metal. The occlusion of gas in the crystal structure retards the transformation. The resistance of a thin layer is higher than that of the massive metal and increases considerably if the thickness becomes smaller. The thin films absorb gas easily and the occlusion of water vapor increases the resistance. Ha (1)

Electro-chemistry of Iron. (Zur Elektrochemie des Eisens.) S. Bodforss. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 160, June 1932, pages 141-157.

An electrode of carbonyl Fe incorporated in a specially designed testing apparatus, is constantly ground off in various solutions and the potentials are determined. The measurements proved that the potential of Fe in aqueous solutions and at ordinary temperatures is a straight line function of the hydrogen ion concentration and of the anions. No evidence was found that ferro or other metal ions exert any influence within the limits of error of the method applied. The author doubts that the normal potential of Fe has actually been determined by e.m.f. measurements with Fe electrodes in Fe salt solutions. The concentration of potential-determining ions present must be taken into account in order to express the normal potential of the reaction taking place in the cell. The dependence of the potential on the concentration of the corresponding metal ions, as claimed by the Nernst formula, does not hold true for ordinary ions with reference to the testing conditions. The reaction $Fe \rightarrow Fe^{\cdot\cdot} + 2\,\theta$ probably occurs at room temperature so slowly that it is superimposed by other processes which proceed faster and thus determine the potential. The investigator sets out to interpret the effect of the H-ions on the basis of Fe-H alloy formation, but his hypothesis does not explain the action of the anions. Next an attempt is made to cover the phenomena observed by assuming an oxide formation and the special properties of the oxide layer are described which are required to satisfactorily explain the experimental observations. Probably we are dealing with adsorption potentials and the potential of Fe and other inactive metals should have the same genesis as the potentials of glass, graphite, quartz and paraffine electrodes. 20 references. EF (1)

Corona Losses on Copper and Aluminum Cables. (Koronaverluste and Kupfer- und Aluminiumseilen.) K. Potthoff. *Elektrizitätswirtschaft,* Vol. 30, Sept. 1931, pages 526-530.

Experiments were performed on Cu and Al cables of 70, 95 and 120 mm.² cross-section with the object of determining the corona losses in dependence on the state of surface and the changes of the corona losses due to corrosion and atmospheric conditions. The testing method is discussed in detail and the results are graphically presented. These may be summarized as follows: The largest corona losses are noticed on new Cu ropes, the lowest on old Al-ropes. At low loads (5 kw./km. max) the effect of the metal surface condition superimposes the influence of the diameter; old Cu rope (uniformly oxidized and no injuries detectable at the surface) is about equivalent to new Al-rope. The surface defects on Cu ropes are less harmful the larger the diameter. Generally speaking the following order of merit in regard to corona losses was established: Cu new, Cu old, Al new, Al old, the latter showing the lowest corona losses. EF (1)

The Changeability of Damping of a Material. (Die Veränderlichkeit der Werkstoffdämpfung.) P. Ludwik & R. Scheu. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, July 9, 1932, pages 683-685.

The damping capacity of a material is called that energy which is converted into heat when the material is subjected to alternating stresses, and is referred to one complete cycle and the unit of volume or weight of the subjected sample. It is measured by the hysteresis energy as taken by the optical hysteresis loop in a torsion-vibrating machine; the loop is plotted as hysteresis energy in kg.cm./cm.³ against the number of cycles as abscissae. The results with several materials are reproduced and discussed, the damping is greatly dependent on frequency and temperature. Phenomena of strengthening and weakening of the material are considered responsible for the hysteresis. Ha (1)

The Transformation of White into Gray Tin (Tin-pest). [Die Umwandlung des weissen in graues Zinn (Zinnpest).] G. Tammann. *Zeitschrift für Metallkunde,* Vol. 24, July 1932, pages 154-156.

Review of the physico-chemical bases for tin-pest, with a discussion of the linear transformation velocity of white into gray tin as affected by temperature, and crystal orientation of the white tin, and also of the effect of additions of Pb, Cd, Bi and Sb in decreasing this velocity, taken from the work of Tammann and Dreyer (*Zeitschrift für anorganische Chemie,* Vol. 199, 1932, page 97). RFM (1)

Production and Properties of Pure Platinum. (Herstellung und Eigenschaften reinen Platins.) Thews. *Die Metallbörse,* Vol. 22, Jan. 30, 1932, page 130.

While the original Wollastone refining process is still in use, the introduction of the high-frequency furnace was of particular significance for the melting technique of Pt and its alloys. The hammer-welding of Pt, the influence of impurities, the physical and chemical properties of the pure metal are fully dealt with. Special attention is paid to the absorption of gases, particularly of hydrogen. EF (1)

Sodium and Potassium Metals. Paul M. Tyler. *Information Circular* 6579, United States Bureau of Mines, April 1932, 7 pages. General. AHE (1)

Textbook of Physical Metallurgy. (Lehrbuch der Metallkunde.) Gustav Tammann. 4th Edition. Leopold Voss Verlag, Leipzig, 1932. Paper, 6 x 9¼ inches, 536 pages. Price 49.50 RM.

The 3rd edition of this treatise appeared in 1923 and was translated into English by Dean and Swenson. Many of the sections of the 3rd edition have been greatly extended or rewritten. The book shows evidence of quite recent revision as many data published this year are included.

The first part of the book discusses the properties of metals, and gives many interesting facts difficult to uncover from other sources. The section dealing with work-hardening and softening of metals is extensive and highly interesting. The second half of the book deals with binary and ternary alloys; types of equilibrium diagrams and actual diagrams are discussed. A valuable part of the book is the special index, which lists references to the most important investigations of several hundred alloy systems. The book is adequately indexed.

No serious student of physical metallurgy can afford to ignore this work. J. L. Gregg (1)-B-

PROPERTIES OF NON-FERROUS ALLOYS (2)

The Heat-Treatment and Annealing of Aluminum and Its Alloys. N. F. Budgen. Chapman & Hall, Ltd., London, 1932. Cloth, 6½ x 10 inches, 341 pages. Price 25s.

During the quarter of a century since Alfred Wilm took out a patent on an alloy, which might be called the first duralumin, to the present time (1907 to 1932) an enormous amount of research work has been done, and numerous articles have been published regarding the composition, heat treatment, and properties of aluminum alloys. The present treatise by Budgen, with a foreword by Prof. D. Hanson of the University of Birmingham, brings together in a single volume and in a well arranged form this extensive information. The method of presentation is a happy balance between the viewpoint of the physical metallurgist and the industrialist.

The general scope of the treatise is indicated as follows: Part I, Heat-Treatment of Wrought Pure Aluminum; Part II, Heat-Treatment of Cast Pure Aluminum; Part III, Heat-Treatment of Wrought Aluminum Alloys; Part IV, Heat-Treatment of Cast Aluminum Alloys; with appendices on the following subjects: I, Practical Details of Melting and Alloying Procedure in the Preparation of Hardener Alloys; II, The Influence of Heat-Treatment upon Corrosion Embrittlement; III, Mechanical Properties of Aluminum and Various Aluminum Alloys at Elevated Temperatures; IV, Pinholes in Aluminum Castings and Their Effect on Heat-Treatment; V, Standard Colour Scheme for Marking Aluminum and Its Alloys; VI, Aluminum Bronze and Its Heat-Treatment; VII, Bibliography of the Heat-Treatment of Aluminum and Its Alloys; and VIII, Bibliography of Aluminum Bronze.

The author has collected his information from a wide source of literature, acknowledgment being made to some 38 principal contributors to the information, and has in addition included a very large amount of original information, which has apparently not been published previously. The 231 figures represent a well chosen collection of microstructures, macrostructures, equilibrium diagrams, property curves, and photographs of industrial products and installations.

The author has indicated in the preface that the book is offered to manufacturers and industrialists, to the academician, and to the general reader. The general treatment of the various subjects is such that the text should be followed by those not specially trained in physical metallurgy, while at the same time the latest developments in this field have been included, and the author has done well in presenting complicated and involved theories.

The numerous aluminum alloys which have been developed for use in the wrought and in the cast condition are discussed in great detail, and reference in all cases has been made to the commercial or trade name under which these alloys are produced.

Throughout the text there is extensive reference to the original literature, and Appendices VII and VIII have 20 pages of bibliography.

The American reader will object to the fact that the author has expressed the tensile strength in tons/in.^{2} and will be amused that in the early part of the text the author has used "shew" and "shewn," while in the latter part he has used "show" and "shown." He will be disappointed that the author has given the entire credit for the invention of the manufacture of aluminum by electrolysis to Héroult and has not mentioned Hall, who was undoubtedly an independent American discoverer, and he may feel that not enough credit has been given to the researches by Merica, Waltenberg, and Scott, published in 1919 relating to the age hardening of the duralumin types of alloys at the time when Dr. Rosenhain in his "Introduction to Physical Metallurgy" wrote " . . . this remarkable behaviour (age-hardening) constitutes one of the most striking unsolved problems in present-day physical Metallurgy." (The quotation is from Budgen's Introduction.)

The book is well written, is a valuable collection of information, and should have a good reception by the three classes of readers for which it is intended by the author.

Who is not interested in the historical development, chemical composition, methods of alloying, melting and casting practice, properties as cast and as heat treated, heat treating practices and theories, macro- and microstructures, and principal uses of pure aluminum and especially such alloys as Duralumin, Superduralumin, Aldrey, Almelec, Silmalec, 51S, Anticorodal, Aludur, Almalsilium, Montegal, Hyblum, Lautal, Aeron, 25S, L. M., Aldal, 17S, Almag, Alferium, "Y" Alloy, Aeral, Arional, RR50, RR53, RR56, RR59, Alclad, Duralumin Substitute, LIV, Wilmil, Alpax, Allautal, Constructal, Skleron, "E" Alloy, Magnalite, Alneon, Neonalium, Aluminum-Beryllium Alloys, Aluminum Bronze, etc., etc.?

Oscar E. Harder (2) -B-

Magnetic Properties of Copper-Nickel Alloys. E. H. Williams. *Physical Review*, Vol. 37, June 1931, page 1681.

The magnetic susceptibility of alloys of Cu and Ni in proportions ranging from 0.1-70% Ni have been studied. Although Cu is only weakly diamagnetic, it requires 0.8 or 0.9% Ni to neutralize this diamagnetic effect, and 56% of Ni is required before the alloy shows ferro-magnetic properties at ordinary temperatures. For amounts of Ni from 1 up to 30% the alloy, whilst paramagnetic in most respects does not obey any law of paramagnetism with regard to temperature. As the temperature is increased the susceptibility first increases and then decreases, the maximum occurring in the neighborhood of the Curie point for Ni. In the case of alloys containing more than 30% of Ni, the susceptibility decreases with increasing temperature for temperatures above 20° C. So far as the phenomena of increasing paramagnetic susceptibility are concerned, there is at present no explanation. It has been suggested that a few atoms or molecules of Ni do not lose their magnetic identity in the alloy, and that these atoms, with their spinning electrons, become more mobile as the temperature is increased. One objection to this is that the susceptibility is independent of the field.

WAT (2)

Special Aluminum Alloys. (Spezialaluminium-legierungen.) E. R. Thews. *Die Metallbörse*, Vol. 22, Apr. 30, 1932, pages 545-546; May 7, 1932, pages 577-578.

The writer alphabetically compiles the chemical analyses of Al alloys known under the following trade names: "A" Aluminum, Acibal, Aeral, Aero Metal, Aerolit, Aeronin, Aldal, Aldrey, Alferium, Almasilium, Aludur, Alneon, Alpax, Aludur 533 + 570, Alumac, Alunean, Aluminit, Alunit, Alusil, Alzen-Metal, Alzin Metal, American alloy, Anticorodal, Argibit, Aviatik Benz, Avional, Bell Metal, Bersch bearing, Birmabright, Bohnalit, Bourbonnes, Constructal 2 + 8, Deutsche alloy, Drittelsilber, Duralum, Duralumin, Durandmetall, Duranic "E" + "F" Alloy, Fletcher metal and bearing, Fontane Metal, Fiary Metal, "G" Metal, Grossman, Haasmetall, Halumin, Hartaluminium, Helumin, Hiduminium, Huron metal, Hyblum, Hyman Inalium, "K" Alloy, KS Seewasser und Kolben, Koltchougalumin. "L-5," Lautal, Liberty Kolben, Lohmanit, Lynit, Maradamit, Mach's alloy, Magnalit, Magnalium "X," "Y," "Z," Maluminium, Manchardt's metal, Meterorit, Mocksilber, Murman's Metal, Navy Aluminum, Nelson Bohnalit, Neonalium, Nickeloy, Nürnberger Gold, Page Dentalmetall, Partinium, "RR" Hiduminium, Rohmium, Romanium, Rübel metal, Ruselit, Scleron, Sibley, Silumin, Suprakolbenmetall, Susini, "T" metal, Telectal, Thalassal, Tiers Argent, Verelit, Vital, Willmill, Woltramium, "Y" alloy, Zimalium, Zisium, Siskon. The analyses of different brands, commercially distributed under the same trade name, are given for some of the alloys listed above. In addition to this, the trade names of further Al alloys are stated, but no analyses are given. In some cases the alloying elements are given. 45 references.

EF (2)

Alloys of Gallium. (Legierungen des Galliums.) W. Kroll. *Metallwirtschaft*, Vol. 11, Aug. 5, 1932, pages 435-437.

Alloys of Ga with Fe, Ni, Cu, Zn, Mg, Bi, Al, Pb, Cd and Sn were examined for hardness and other mechanical properties. Ga has little effect on Fe, Ni and Cu, while it makes Zn brittle. The lowest melting point alloy obtained was with 12% Sn, which melts at 15° C. This alloy might be used for filling thermometers. Gas has little effect on Al in the binary alloy, but in the ternary alloy with Al and small quantities of Mg it acts similarly to Zn. With 4% Ga a Brinell hardness of 119 was obtained after quenching from 520° C. and aging at 130° C. However, these alloys have poor corrosion resistance. There is not likely to be any practical use for Ga alloys. 4 references.

CEM (2)

Dynamic Strength Properties of Several Light Metals. (Dynamische Festigkeitseigenschaften einiger Leichtmetalle.) K. Matthaes. *Zeitschrift für Metallkunde*, Vol. 24, Aug. 1932, pages 176-180.

The following alloys were studied: Duralumin, Lautal, Aeron, Elektron "Deutsche Legierung" (Al with 0.23% Si, 1.50% Cu, 0.60% Fe, 15.31% Zn, 0.12% Mg). Stress-strain curves (for bending and torsional stresses) are given for the alloys named; also notch-impact curves in the temperature range −180° to +100° C. The notch-impact values for Al-alloys increase with diminishing temperature, but for Mg-alloys decrease. Curves are given showing the effect of changing cross-section upon the endurance (for bending stresses) of Elektron. Anodic oxidation of duralumin is shown to increase its resistance to corrosion-fatigue. (2)

A Study of Certain Light Aluminum Alloys and Aluminum Bronzes. (Etude de Certains Alliages legers d'Aluminium et de Bronzes d'Aluminium.) Camille Matignon. *Chimie et Industrie*, Vol. 27, June 1932, pages 1259-1273; Vol. 28, July 1932, pages 23-36.

The conclusions reached in the first part of the study are as follows: (1) All the light alloys deteriorate more quickly than Ag. (2) Al bronze with 9% Al is much more resistant to deterioration than a monetary bronze; even with 7% Al, there is a tendency towards less resistance. (3) Tests made by Messieurs Schloesing and Badin conform to the extent that the alloys can be classed according to their corrosion resistance in the following order: bronze with 9% Al; bronze with 7% Al and monetary bronze; Ag; alloy R-4, Kallium 250, Kallium 350; alloy A-5 with 10% Al-Mn, 10% Al-Zn, 10% Al-Ag; Kallium 100; Beka; alloy with 5% Al-Mn. From the results of the tests on the first and second groups, it can be seen by comparison that alloy R-4 takes its place beside Kallium 250 and 300 and alloy A-5 beside the alloys with Mn and those with 10% Ag. From chemical tests it follows that: (1) the alloys with 5 and 10% Mn have a greater resistance to sea water; (2) the alloys most severely attacked are the 5 and 10% Al-Ag alloys; the results confirm those already obtained with the alloy A-5 of Boute, which contains 5% Ag; (3) the alloy with 10% Zn is less resistant than the alloys with Mn; it is more readily attacked than R-4, as shown by examination and indicated in tables; (4) the Kallium alloys appear a bit inferior to alloy R-4. Their inferiority is particularly apparent when parts are left in the solution, for they continue to oxidize; (5) bronze with 7% Al is still attacked by NaCl solutions; on the other hand, it resists Na solutions well, even caustic soda solutions. Part II. The author describes his experiments and comes to the following conclusions: The Al bronze of Sainte-Claire Deville appears to possess all the properties of an excellent monetary metal: (1) Its preparation requires care but does not present real difficulties. The use of sufficiently pure materials and protection from oxidation during melting and cooling simplifies this operation. (2) The industry thus can be furnished with a homogeneous product of sufficiently constant composition. (3) The Al bronze prepared with the usual technique is not difficult to work. Moreover it does not oxidize appreciably during that process. (4) Its mechanical properties are similar to those of acid Bessemer steel with 0.35% C. It has a high resistance to torsion. (5) Its properties after annealing and tempering vary within wide limits, particularly its elastic limit and its tensile strength. This property can be used profitably. (6) It is inexpensive and readily available. (7) It has an attractive color and takes a polish perfectly. (8) Al bronze does not have the unpleasant odor of Cu. (9) Though it is not as light as Al and other alloys studied, its density is about 15% less than that of monetary bronze and its mechanical properties are remarkable.

MAB (2)

PROPERTIES OF FERROUS ALLOYS (3)

The Ferromagnetic Alloys and their Industrial Application. (Die Ferromagnetische Legierungen und ihre gewerbliche Verwendung.) W. S. Messkin & A. Kussmann. Julius Springer, Berlin, 1932. Cloth, 6¼x9¼ inches, 418 pages. Price 44.50 RM.

Of the authors, Messkin is chief of the section on magnetic alloys in the Institute of Metallurgical Research in Leningrad and Kussmann is a member of the magnetic laboratory of the Physical Technical Institute in Berlin—Charlottenburg. Collaboration may be said to be the keynote of this monograph. No other work combines so successfully the thorough and yet not difficult treatments of the science and practice of magnetics, of the physical metallurgy of magnetic alloys, and of the considerations governing the practical utilization of these alloys contained in this book. The preface states that the original manuscript by Messkin was revised and extended by Kussmann. It is not plain whether or not the original was in Russian. At any rate the final German text makes unusually clear and easy reading.

There is a good elementary exposition of magnetic properties and magnetic testing followed by a very complete general discussion of the relations between the constitution and structure of the various magnetic alloys and their magnetic properties. Here the iron-carbon alloys provide the main illustrative subject matter, but the other alloys are not slighted and adequate discussions with constitution diagrams are given of the Fe-Co, Fe-Cr, Fe-Ni, Fe-Si, Fe-W, Ni-Co, and other alloys. The effects of heat treatment and also of deformation are excellently covered. There is a fairly good chapter on magnetic analysis. The chapter on machinability and hot and cold workability of magnetic alloys while good seems rather brief in comparison with the proportions of the other parts of the book. This much covers about half of the text. The rest, devoted to a detailed discussion of the properties, treatment and applications of specific magnetic materials, probably constitutes the most valuable part of the book. This portion is divided into three sections—on permanent magnet steels, on dynamo and transformer materials, and on magnetic alloys for special purposes. Good accounts are given of the cobalt magnet steels and of the permalloys.

At every turn the treatment is skillful, well informed and astonishingly up-to-date. There is some apparent overlapping between the first and second parts of the book but, of course, no actual duplication. There is a good index. Due to the wide scope, some of the material is condensed as in a handbook, but for the most part the style is interpretative and critical and in the best encyclopedic tradition.

Samuel Epstein (3) -B-

High-Test Iron for Pressure Castings. H. H. Judson. *Transactions American Foundrymen's Association,* Vol. 3, July-Aug. 1932, pages 153-167.

To make satisfactory cast Fe for pressure castings the metal is taken from 2 cupolas. One cupola operates on charge of steel scrap, Si pig and spiegeleisen producing an iron with 2.40-2.80% C and 1.40-1.80% Si. The second cupola produces an iron with 3.50% C and 2.40% Si. In mixing the ratio of low C to high C iron is 3.5 to 1 giving a product with 2.74% total C, 0.75% combined C, 1.70% Si and 1.09% Mn. The properties of the latter are 46,500 lbs./in.² tensile and 51,500 lbs./in.² shear strength, 212 Brinell hardness and 6,000 lbs./in.² bursting pressure. Transverse tests of 1¼" round arbitration bars on 12" centers gave 5,000 lb. strength and 0.09" deflection. It is remarkable that in casting this metal no risers are used regardless of casting section. CHL (3)

Brinell Hardness and Tensile Strength of Cast Iron. J. G. Pearce. *Foundry Trade Journal,* Vol. 46, May 26, 1932, page 328.

Excerpt from April *Bulletin of British Cast Iron Research Association.* See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 290. OWE (3)

The Structure and Mechanical Properties of Cast Iron. J. G. Pearce. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 6-14.

The properties of cast Fe vary not only with composition but also with melting conditions which affect the size and distribution of the graphite. If all graphite is in solution and no nuclei are added, a soft, machinable iron with fine graphite will result, while if nuclei are present, the same iron will be pearlitic. A mixed structure, which may also be obtained, is inferior to either. The structure depends on the nuclei and these depend so much on melting conditions that change of strength can only be correlated with change in Si for given melting conditions. This is illustrated by curves for different Si and different size bars for compositions and melting conditions leading to variation in type of graphite. 3 references. HWG (3)

Hardness and Machinability of Cast Irons. (Dureté et Usinabilité des Fontes.) C. Baron. *La Fonderie Belge,* Vol. 2, Apr. 1932, page 66.

Comparative results (concerning pearlitic, ferritic and austenitic cast irons) given for hardness and machinability show that hardness number without indication of structure gives no measure of machinability. When structure is indicated, hardness number gives valuable information on machinability. However the author has found cast irons with normal hardness and low machinability, this fact being probably due to numerous Mn sulphide inclusions which do not affect hardness but disturb the cutting action of tools. FR (3)

The Strength of Materials as Affected by Discontinuities and Surface Conditions. F. C. Lea. *Engineering,* Vol. 134, Aug. 26, 1932, pages 256-258; Sept. 2, 1932, pages 280-281.

Condensed from paper read before a joint meeting of the Ceramic Society and the Society of Glass Technology, Feb. 24, 1932. Gives results of tests on C steels containing from 0.09 to 0.86% C and on Ni-Cr steels. Discusses plasticity and discontinuities, effect of surface conditions produced by heat treatment of steels, effect of cold working on surface conditions, effect of corrosion on failure under repeated stresses, and static and dynamic impact tests. LFM (3)

Effect of Section On Tensile Strength of Gray Iron. F. P. Gilligan & James J. Curran. *Iron Age,* Vol. 129, May 1932, pages 1106-1107, 1125.

Gives results of investigation of the sections of some large gray Fe cylinders which failed in service. References in the literature are very meager on the strength of cast Fe in heavy sections. Refers to the work of Rather and Bolton on the subject. The castings investigated were hydraulic cylinders, weighing about 30,000 lb. each, with wall thickness of about 10½". Internal pressure to which they were subjected reached as high as 6000 lb./in.² The composition of the 2 cylinders were:

	Total C	Mn	Si	P	S
No. 1	3.48	0.49	2.18	0.588	0.072
No. 2	3.48	0.71	2.26	0.682	0.055

Authors conclude that strength of castings of different thickness follows a definite law and the effect of composition is greatly minimized as the section increases. Give the probable strength range for all composition in heavy sections and a chart for sections from 2" to 10½" thickness. VSP (3)

Is Carbon Steel used to the Best Advantage? Bernard Thomas. *Iron & Steel Industry & British Foundryman,* Vol. 5, Apr. 1932, pages 273-275.

Carbon steels, in many instances, may be used instead of alloy steels, providing always that conditions are carefully considered beforehand and wherever possible correct heat treatment is applied. A number of examples are cited where the higher costs of alloy steel are paid in cases where a straight carbon steel would suffice if only care and attention was paid to manufacturing and heat treating details. CHL (3)

Ferromagnetism and Electrical Properties. III. The Relation between Increase of Resistance and Magnetization. (Ferromagnetismus und elektrische Eigenschaften. III. Der Zusammenhang von Widerstandszunahme und Magnetisierung.) K. Schneiderhan. *Annalen der Physik,* Series 5, Vol. 11, Oct. 1931, pages 385-405.

Tests made on Ni wires had the principal result that below the Curie point the magnetic increase of resistance is saturated and can be represented as a function of the magnetization. There are, however, certain differences between single crystal and polycrystalline material. Ha (3)

The Aging of Mild Steels after Hardening and its Consequences for Fusion Welding. (Das Altern der weichen Stähle nach dem Härten und seine Folgerungen für die autogene Schweissung.) Seigle. *Die Schmelzschweissung,* Vol. 11, Aug. 1932, page 173; *Revue de la Soudure Autogene,* 1932, No. 219, pages 2514-2516.

Tests on steels hardened in water from 500° to 950° C. showed that a soft Thomas steel, after hardening at 625° C. had a tensile strength of about 40 kg./mm.², a month later more than 60 kg./mm.² When hardened at 700° C., the figures were 50 and 70 kg./mm.² respectively and at 800° and 900° C., 50 and 60 kg./mm.² Equilibrium was obtained at 600°, 800° and 900° C. after 20 to 25 days, at 700° C. after 30-35 days. The notch-toughness shows, however, a decrease in value with time. Welded pieces should not be cooled in red-hot state, the welder must wait and immerse the piece in water only after it is reasonably cool. The question of corrosion and failures is discussed in the light of results from these tests. Ha (3

Physical Properties of Heat-treated Cast Iron. F. G. Sefing & M. F. Surls. *Michigan State College Engineering Experiment Station Bulletin* No. 47, June 1932, 36 pages.

Detailed data are given on tensile, transverse and impact tests of irons with 3.20-3.56% total C, 2.51-2.75% Si, having 7% steel in the cupola charge and of those with 3.22-3.38% total C, 2.36-2.57% Si, having 25% steel in the charge; in annealed, water-quenched and quenched and tempered conditions. The authors say: "It is regretted that tapping and pouring temperatures of the irons are not available for it is believed that they have a profound influence on the properties of the iron. There is little explanation or theory advanced concerning the structural changes that take place. Reasons for the results are omitted so that the data shall stand on their own merits." The trends of the data are in general along the lines that would be expected, but the individual data are erratic, and it is difficult to draw definite conclusions from the graphs. The materials classed together varied somewhat as to structure and properties in the as cast condition and these initial differences are thought to affect the properties after heat-treatment. HWG (3)

The Heat Treatment of Chromium-Magnetic Steel. (Die Wärmebehandlung von Chrom-Magnetstahl.) Wenjamin S. Messkin & Emeljan S. Towpenjez. *Archiv für das Eisenhüttenwesen,* Vol. 6, Aug. 1932, pages 75-78.

Report of the Institute of Metallurgy Research in Leningrad. The purpose of this paper was to study the magnetic properties of an open-hearth steel, containing 1.33% C, 0.37% Si, 0.55% Mn, 0.048% P, 0.033% S, 2.15% Cr and 0.065% Ni, under various heat treatments. It was established that the best magnetic properties were obtained by hardening at 850° C. in oil. The steel should not be held too long at temperatures between 750° and 850° C., because the magnetic characteristics would be impaired. It is probable that certain reactions taking place in the Cr bicarbides are answerable for this harmful effect on magnetic properties of the steel. In order to improve a steel impaired by wrong heat treatment, it should be heated up to between 950° and 1000° C., kept at this temperature from 30 min. to 1 hr., and then quenched in the atmosphere. The customary hardening will then follow. In the above case if the steel was overheated during normalizing, then it should be annealed at 150° to 250° C. prior to hardening. Results and conclusions made in past work on this subject have been confirmed in general. For example, it was shown that no unlimited relation exists between coercive force and hardness. Likewise during tempering of hardened steel it is indicated that the measurement of the magnetic saturation may be replaced by the measurement of the maximum induction. DTR (3)

Refined Steels. (Vergütungsstähle.) E. EICHWALD. *Automobilischnische Zeitschrift,* Vol. 35, Aug. 10, 1932, pages 363-369.

The article contains a comprehensive review of 11 standardized and 155 other steels and alloyed steels as they are now made in Germany. The list gives manufacturer, composition, tensile strength, elastic limit, elongation, reduction of area, heat treatment for forging, annealing, hardening and tempering, and the principal fields for application. A special list shows the best steels for automobile parts. Unalloyed steels are generally used for parts with low endurance stresses. A refined steel is defined as a steel of special composition, the mechanical properties of which can be improved after forging by a certain heat treatment; they are particularly resistant to endurance and alternating stresses and to wear. Ha (3)

High Strength Cast Iron with Pearlitic Structure (Fonte de Haute Qualité à Texture Perlitique). E. BRIALMONT. *La Fonderie Belge,* Vol. 2, Mar. 1932, pages 45-47.

Cylinders for steam and Diesel engines as well as pistons and piston rings must be hard enough to resist wear. There is a close relation between hardness and strength. On previous castings, thicknesses must not be too heavy to prevent low hardness and strength. In Belgium, specifications are as follows: (1) Shock resistance: at least a drop of 45 cm. of a 12 kg. mass on a test-bar with square section 40 x 40 mm. and 160 mm. between supports. 1st drop = 35 cm., 2nd drop = 40 cm., 3rd = 45 cm., etc. . . . (2) Brinell hardness: at least 207. Advantages of high quality cast Fe are: (1) castings have a high surface finish after machining; (2) fine graphite reduces abrasive action on wearing parts; (3) high resistance to wear; cylinders remain true cylinders; (4) absence of leakage in joints of wearing parts and corresponding high efficiency of gas pressure; (5) long life of machines. Test results are given for 30 different cast irons. Drop height varies between 50 and 70 cm., tensile strength between 26.7 and 29.9 kg./mm.^{2}, Brinell hardness between 208 and 235. FR (3)

Effects of Inclusion Streaks on the Tensile and Dynamic Properties of Wrought Iron and Similar Materials. F. R. HENSEL & T. F. HENGSTENBERG. *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 488, Oct. 1932, 29 pages.

Tensile, Brinell, impact, and endurance tests were made on hand-puddled wrought Fe, artificial wrought Fe, ductile and brittle ingot Fe, and medium C steel with and without ghost lines. Both longitudinal and transverse samples of hand-puddled wrought Fe and mild steel were used. The tests indicated that inclusion stringers do not influence the mechanical properties when the stress is parallel to the stringers. Both wrought Fe and ghost-line steel gave lower values of strength, elongation, impact resistance, and endurance limit when the stress was perpendicular to the stringers. The tensile values for tests on wrought Fe parallel and perpendicular to the stringers were 46,300 and 35,600 lbs./in.^{2} tensile strength, 24,900 and 22,500 lbs./in.^{2} yield point, 29.6 and 6.6% elongation in 2", and 35.7 and 6.7% reduction of area. The Izod impact values were 35.5 and 10.0 ft.-lb. The endurance limits were 27,300 and 22,200 lbs./in.^{2}, respectively, for stresses parallel and perpendicular to the stringers. Tests were made on a Farmer-type machine. The brittle ingot Fe had low impact values. Tests over a range of temperatures indicated that the almost vertical part of the impact-temperature curve was shifted to higher temperatures for the brittle Fe. Tests on carburized samples showed that the effects of inclusions are much more pronounced in a relatively hard matrix than in the soft Fe matrix of wrought Fe. This paper was prepared for presentation at the Buffalo meeting, but was withdrawn after it had been issued as a Technical Publication. 37 references. JLG (3)

The Influence of the Carbon Content on the Structure and the Tensile Properties of Gray Iron with Consideration of different Silicon Contents, Pouring Temperatures and Wall Thicknesses. (Einfluss des Kohlenstoffgehaltes auf das Gefüge und die Festigkeitseigenschaften des grauen Gusseisens, unter Berücksichtigung verschiedener Siliziumgehalte, Giesstemperaturen und Wandstärken.) A. KOCH. Doctor's thesis, Technische Hochschule, Aachen, June 1932, 15 pages.

Systematic tests under uniform conditions are described, the results of which can be stated briefly as follows: The content of graphite of cast Fe increases with increasing C content; the structure is thereby weakened which causes a deterioration of all tensile properties. For the same pouring temperature the "effective" overheating is reduced with decreasing C content which causes a finer structure and improves especially the endurance impact strength. Si improves the pourability but lowers the mechanical properties by greater segregation of graphite and disintegration of carbide. An increased cooling velocity (small wall thickness, low pouring temperature) counterbalances this injurious influence of Si to a certain extent; for each C content and for each wall thickness and pouring temperature there exists an optimum of Si content. Increasing wall thickness increases the graphite content, bending and tensile strength decrease, the hardness is greatly influenced. Increasing pouring temperature increases the preheating of the mold, solidification is delayed, segregation of graphite favored; the latter again lowers the mechanical properties. In order to obtain high values of strength the pouring temperature should be as low as possible; the lowest temperature is given by the liquidus point for the respective composition of the Fe. The test results are reproduced in full. 27 references. Ha (3)

Growing of Cast Iron. (Das Wachsen von Gusseisen.) OTTO EBLING. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Sept. 4, 1932, page 462.

The various causes of growing are discussed: (1) progressing decomposition of free Fe_3C and pearlitic Fe_3C or the separation of C from the solid solution at temperatures above 710° C., (2) disintegration of structure due to temporarily shifted effects of structural transformations and stresses thus originating, (3) type of graphite formation, (4) oxidation, (5) gas content, (6) supposed effects on disintegration due to vibrations and (7) oxidation of the Si in ferrite to SiO_2 or silicates. GN (3)

Variation in Hardness as a Function of Thickness in Cast Iron Castings. (La Variation de la Dureté en Fonction de l'Epaisseur dans les Moulages de Fonte.) M. BALLAY. *La Fonte,* Oct. 1931, pages 51-56.

Ordinary cast Fe tends to be white or mottled in light sections and gray in heavy sections of castings. When Fe is gray throughout the casting, graphite is fine in light sections and in coarse flakes in heavy sections. Then there is a variation of hardness between different thicknesses in the same casting; this is called "heterogeneity of section." But in the same section of a casting hardness varies also from skin towards inside; this is called "heterogeneity in depth." For lessening heterogeneity in ordinary cast irons C content must be as low as possible but high enough to have light sections of castings with gray structure. It is also possible to decrease the difference between cooling rates of sections by heating the mold. Cr, Mo, V, increase heterogeneity in alloy cast irons. Ni, when substituted for a part of the Si of the Fe is a valuable element to lessen heterogeneity. When Si content cannot be lowered, Ni and Cr additions are made together in the ratio Cr/Ni = ⅓-¼. In martensitic irons, heterogeneity is light and can be lessened by suitable annealing treatment. Austenitic cast irons are very homogeneous. Heat treatments are mentioned. FR (3)

Stability and Retention of Temper of Steels Containing Certain Difficultly Soluble Carbides. (Haltbarkeit und Auslassbeständigkeit von Stählen mit Schwerlöslichen Sonderkarbiden.) EDUARD HOUDREMONT, HUBERT BENNEK & HANS SCHRADER. *Archiv für das Eisenhüttenwesen,* Vol. 6, July 1932, pages 24-34.

Report 182 of Committee on Materials of Verein deutscher Eisenhüttenleute. Includes discussion. The manner in which certain carbides affect hardness and temper was studied for W steels and particularly for V steels. As a result of the removal of C for the formation of the carbides in question, the hardness of these steels is diminished when compared with C steels at equal hardening temperatures, because most of these special carbides are much less soluble than cementite. On account of the action of these carbides in arresting crystallization, these steels are only slightly sensitive to overheating. With rising temperature the carbides continue to go into solution more and more, the critical rate of cooling decreases, and hardening increases throughout the material. During annealing, these special carbides, that are difficultly soluble at elevated temperatures, separate or precipitate out. This precipitation occurs first at high temperatures and again from the α-solid solution, producing thereby a kind of precipitation hardening. This in turn compensates for a falling off in hardness due to the disintegration of martensite and leads to the secondary rise in hardness between 500° and 600° C. This precipitation of V carbide is the cause of the higher cutting performance and strength under heat of V steels, that are given appropriate preliminary treatment. With highly alloyed steel, for example high speed steels, an additional rise in hardness may be had through transformation of the residual austenite. The retention of temper, in comparison, is solely dependent on true precipitation hardening of the carbides in question. The action of V was examined still further on many alloyed construction steels. After corresponding heat treatment the effect is likewise manifested in a high retention of temper. Simultaneously however, the notch strength or toughness dropped off proportionately as a result of the separation of V carbide. Tables of results and graphs are given showing effects of varying additions of W or V, annealing temperature and time, cross-section of bar, etc., on hardness, retention of temper, heat strength, cutting performance, and other physical and magnetic properties. DTR (3)

New Developments in Alloy Steels and Irons. *Canadian Chemistry & Metallurgy,* Vol. 16, Sept. 1932, pages 240-242.

A series of 18-8 Cr-Mn steels containing 17-19% Cr, 5-10% Mn, and small % of Cu or Cu and Ni have been developed recently. Varying the amounts of alloying elements makes it possible to produce a grade suitable for the production of castings or one adapted to the manufacture of wrought articles. Strength is maintained to a remarkable degree at temperatures from 1375°-1650° F. For moderate corrosion and heat resistant use a 4-6% Cr alloy steel has been introduced. A Ni-Mn-Fe alloy resists HCl to a high degree, also H_2SO_4, acetic acid, and formic acid. It may be cast, forged, or rolled, and welded by oxyacetylene or the electric arc. Cromansil steels contain relatively small amounts of Cr, Mn and Si and are used as new engineering steels. They are produced by the open hearth process. WHB (3)

Molybdenum-Copper Steel (Molybdän-Kupferstahl [Witterungsbeständiger Stahl]). WIESSNER. *Bautechnik,* Vol. 19, Aug. 26, 1932, page 472.

The weather stability of Cu steels can be increased further by adding Mo. Typical analysis: 0.8-1.4% Mn, 0.4-0.7% Si, 0.25-0.6% Cu, up to 0.3% Mo, 0.20% C is best for parts up to 18 mm. thick and 0.25% for parts above 18 mm. Good welds are obtained with all types of welding methods. Electrically butt welded seams give a tensile strength of at least 90% of the base metal. The steel is particularly adaptable to riveting. Conditions when this steel is economically to be used as structural steel are discussed. The principal field of application is bridge building, exhibition and industrial halls with a large span width. GN (3)

Refractory Cast Iron and its Production. (Les Fontes Rèfractaires et leur Fabrication.) G. D'ARDIGNY. *Revue de Fonderie Moderne,* Vol. 26, Aug. 25, 1932, pages 265-270.

The expansion curves of a cast Fe at heating and cooling and the way they are affected by graphitization, transformations of the Fe phases and by internal stresses are discussed and explained by examples. To obtain a cast Fe as free as possible of irregular expansion and behaving well under heat, the content of Si and C should be small and that of Mn great; the addition of Cr, Ni-Cr, Ni-Cu-Cr is advantageous. The relative importance of these factors is determined by the ultimate use of the metal; they must be selected according to the machinability, castability and means of melting available. Several compositions for various purposes are given. Ha (3)

Contribution to the Mechanics of the Plastic Behavior of Mild Steel. (Beitrag zur Mechanik des bildsamen Verhaltens von Flussstahl.) K. Hohenemser & W. Prager. *Zeitschrift für angewandte Mathematik und Mechanik,* Vol. 12, Feb. 1932, pages 1-14.

Steel tubes of 34 mm. inside diameter and 3 mm. wall thickness were submitted to simultaneous tension and torsional stress. The experiments yielded the following results: under changeable combined tensile and gliding stress, Mises condition of flow does not hold true for steel as Lode's experiments with fixed main axis directions indicated. Even if one tries to eliminate the influence of strain hardening, considerable irregularities in the observed flowing conditions are experienced which seem to point at anisotropies due to the initial deformation. Nevertheless the relationship between stresses and deformations are approximately covered by a new equation with reference to an isotropic continuum. This equation includes as special cases the equations of Saint-Venant-Mises and Prandtl-Reuss. The writers place emphasis on the fact that this newly established equation only represents their test results in an idealized manner and urge a check on other metals and single crystals. EF (3)

The Properties of Nickel-Chromium Alloys and Their Manufacture. A. M. Korolkov. *Tzvetnuie Metallui,* Nov. 1931, pages 1471-1474.

The purpose of the investigation was to obtain alloys possessing a high electric resistance and resistance to oxidation at high temperatures up to 1000° C. The suitability of these alloys for the manufacture of wires and strips was also investigated. A number of alloys available on the market were examined, and for the present work the compositions similar to those of materials made by Heraeus Vakuumschmelze were selected. Melts were made from purest materials available. The alloys prepared analyzed from 61 to 84% Ni, 9 to 22% Cr, 10 to 22% Fe and 1.7% Mn. Other impurities were low. The loss of Cr was as high as 15 to 23%. Microstructure of all alloys is given. All the alloys were satisfactorily cold rolled into a 5 mm. strip, or wire 2.6 mm. in diameter. The wires were then annealed at 950°-1000° C. and drawn to 2 mm. These were annealed again and drawn to 1.5 mm. Mechanical properties of the alloys are given. Tests showed that the electric resistance, temperature coefficient and resistance to oxidation at high temperatures render the alloys suitable for use in heating coils, the ternary Ni-Cr-Fe alloys being the best. Details are given in tables, diagrams and photomicrographs. BND (3)

Properties of some Silico-Manganese Steels. G. Burns. *Foundry Trade Journal,* Vol. 46, May 19, 1932, page 308; *Rolling Mill Journal,* Vol. 7, No. 1, 1932, pages 33-34; *Engineering,* Vol. 133, May 27, 1932, pages 621, 643-644; *Iron & Coal Trades Review,* Vol. 124, May 6, 1932, page 757.

Condensed from paper read before the British Iron & Steel Institute. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 341. LFM + Ha + MS + OWE (3)

Mechanism of Deformations in Gray Iron. J. W. Bolton. *Transactions American Society for Testing Materials,* Vol. 32, Pt. 2, 1932, pages 477-491.

Susceptibility to permanent deformation in gray cast Fe is found to be dependent on the size and distribution of graphite flakes as well as on their amount. Room-temperature creep tests indicate that gray irons do not creep at room temperature when loaded to 80% of their tensile strengths. This suggests that although gray Fe possesses no apparent true proportional limit (because of the permanent set phenomena) the elastic limit (or more accurately the limiting stress at which statically loaded bars will not "flow" and rupture) is somewhat above 80% of the tensility and probably approaches it rather closely. VVK (3)

Alloy Cast Steel. (Les aciers spéciaux coulés.) E. Kothny. *Bulletin de l'Association Technique de Fonderie,* Vol. 6, Feb. 1932, pages 58-67.

Translated from *Die Giesserei,* July 31, 1931 and Aug. 7, 1931. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 298. FR (3)

Progress in the Manufacture of Heat Resistant Steel. (Fortschritte in hitzbeständigen Stahl.) Th. Hoffmann. *Korrosion,* supplement to *Chemische Apparatur,* Vol. 19, June 25, 1932, pages 21-22.

Alloying with Al and Cr makes steel more heat resistant without appreciably changing its mechanical properties. Ferrite-pearlite steels are made heat resistant by adding Al, which reduces the rate of gas diffusion into the steel. "Sicromal" 8, 9, 10, and 12 are recommended for temperatures of 800°, 900°, 1000° and 1200° C. respectively. BER (3)

The Flexibility of Corrugated Pipes under Longitudinal Forces and Bending. L. H. Donnell. *Transactions American Society of Mechanical Engineers,* Vol. 54, June 15, 1932, Applied Mechanics, pages 69-75.

Expansion bends of steam lines or applications where the maximum longitudinal or bending flexibility is required are made of pipes with circumferential corrugations. The longitudinal flexibility is calculated for several types of corrugations, and from this analysis a "reduced modulus of elasticity" is derived by which corrugated pipes can be calculated as if they were smooth; this same modulus is suggested for use also in calculating the bending of corrugated pipes. The full theoretical derivation is given for V-shaped and for semicircular corrugations. Ha (3)

Some Mechanical Properties of Cast Iron. (Considérations sur quelques propriétés mécaniques des fontes.) J. R. Maréchal. *Revue Universelle des Mines,* Series 8, Vol. 8, Aug. 1, 1932, pages 92-97; Aug. 15, 1932, pages 117-123.

A correlated abstract of investigations on the subject by Meyersberg, Rudeloff and other German authors published in *Die Giesserei* and *Krupp'sche Monatshefte.* Ha (3)

Migra-Iron, a New Special Pig-Iron for High Quality Castings. ("Migra-Eisen," ein neues Spezialroheisen für hochwertigen Guss.) E. Piwowarsky & A. Wirtz, Jr. *Giesserei,* Vol. 19, Apr. 1, 1932, pages 121-122.

See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 3. Ha (3)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)

A New Theory of Corrosion of Alloys. (Eine neue Theorie der Strukturkorrosion.) G. Akimow. *Korrosion und Metallschutz,* Vol. 8, Aug. 1932, pages 197-205.

The electrochemical theory of corrosion is broadened to include alloys. The nature and location of the attack is attributed to differences in potentials resulting from: positions of molecules in the space lattice, grain boundaries, heterogeneity produced by presence of solid solutions or intermetallic compounds and physical inhomogeneity. In different types of solutions the polarity of one particle with respect to another may be reversed. Film formation may also alter the potentials. In any heterogeneous alloy some points become anodic and some cathodic. A scheme is presented for the prediction of anodic and cathodic areas. If a series of connected electrodes I, II, III, IV . . . . N, is present whose potentials in a certain electrolyte are V_1, V_2, V_3, V_4 and V_n and if $V_1 < V_2 < V_3 < 4 \ldots < V_n$ an electrode X will become the external member of the series. When $V_n - X_x > V_x - V_1$, X becomes an anode and vice versa. The electrode X divides the series into 2 parts, cathodes to the left and anodes to the right when $V_n - V_x = V_x - V_1$. Solving this equation $V_x = \frac{V_n + V_1}{2}$. Increasing the anodic areas does not increase corrosion while the reverse is true for cathodic areas. A few experiments with Al alloys containing Cu or Zn give an indication that the theory is valid. Alloying Al with Zn reduced the chemical resistance of the Al. The corrosion phenomena are explained by the new theory. The effectiveness of Mg additions to Al-Cu alloys in preventing intercrystalline attack is also explained by this theory. However, as yet the necessary data to establish firmly the theory of "Strukturkorrosion" are very meager and the author promises further results in a later publication. BER (4)

Protection of Al Alloys by Means of Metals Sprayed on by the Schoop Process. (Korrosionsschutz von Aluminiumlegierungen mittels metallischer Ueberzüge nach dem Schoop'schen Spritzverfahren.) G. Akimow & W. Kroenig. *Korrosion und Metallschutz,* Vol. 8, May 1932, pages 115-119.

Plain, riveted, irregularly shaped pieces of duralumin, duralumin-Fe couples and duralumin-stainless steel couples were sprayed with metallic coatings by the Schoop process. The metallic pieces were exposed to a spray of 10% NaCl solution and the mechanical properties determined after 40 days. The sprayed metals showed no decrease in tensile strength or elongation while the uncoated sheets showed a decrease in tensile strength of 13% and in elongation of 24.5%. Cd-Zn coatings kept a good appearance. Zn coatings showed signs of deterioration. Al sprayed upon Fe-Duralumin couples did not afford good protection. Cd coatings were not very satisfactory for couples. An alloy of 83% Cd and 17% Zn proved most satisfactory and also afforded electrochemical protection to duralumin in Black Sea H_2O. Immersion tests were made in the Black Sea. Zn coatings suffered less deterioration than in salt spray. Al coatings were subject to localized attacks. Uncoated duralumin was quite severely attacked. Zn and Al afford electrochemical protection to duralumin; Cd does not, particularly if the structure is riveted. Unprotected duralumin was subject to great deterioration in tensile strength and elongation. Cd-Zn coatings are recommended for duralumin or metallic couples subjected to a casual contact with sea H_2O. For submerged pieces Cd-Zn also seems best. Pure Cd is ineffective. Al can also be used but it must be extremely pure. Zn is the least satisfactory. BER (4)

Recent Investigations on the Atmospheric Corrosion of Cu. (Neuere Untersuchungen über die atmosphärische Korrosion von Kupfer.) W. H. J. Vernon. *Korrosion und Metallschutz,* Vol. 8, June 1932, pages 141-147.

In order to determine the effect of SO_2 on the patina formed on Cu in the atmosphere, experiments were conducted in which plates of Cu and Cu containing 0.45% As were exposed in the laboratory to air containing 0.1-10% SO_2 at relative humidities of 50-99%. Weight increase-time curves were of the exponential form. Between 0.0 and 1.0% SO_2 a maximum was reached at 0.5% SO_2 and a minimum at 0.85%. Above 1% SO_2 the weight increased with the SO_2 concentration. The critical humidity apparently lay between 63 and 75%. Far more corrosion took place when the critical humidity was exceeded. Below 0.85% SO_2 the corrosion products were $CuSO_4 \cdot x\ Cu(OH)$; x decreasing as the % SO_2 increased. Above 0.85% SO_2 corrosion products were $CuSO_4 \cdot y\ H_2SO_4$; y increasing as the % SO_2 increased. At 0.85% SO_2 the corrosion product was $CuSO_4$. The $CuSO_4$ being washed away when corrosion occurred in the atmosphere the residual product became more basic with time. The corrosion product on high conductivity Cu was very hygroscopic. The presence of 0.45% As reduced the hygroscopicity of the corrosion product and hence the corrosion rate, and more as the time of exposure was increased. CO_2 produced no discoloration. SO_2 caused the green patina found in densely populated regions. However, no sulphite was found in the corrosion product and hence the author believes that the Cu catalyzed the oxidation of SO_2 to SO_3. These laboratory experiments confirmed the author's previous contentions that SO_2 was the cause of the green patina and that CO_2 was relatively unimportant in its development. BER (4)

Effect of Properties of Water on the Construction of Hot Water Storage Tanks. (Einfluss der Eigenschaften des Wassers auf den Bau von Heisswasserspeichern.) S. Ottenstein. *Elektrizitätswirtschaft,* Vol. 30, June 1931, pages 357-359.

After 10 years experience on electric hot water tanks, it has been found that Sn-plated Cu furnishes the best material in regard to corrosion resistance. Riveting of the Cu-shells yielded the best results and electrodeposition of Sn has been generally adopted. EF (4)

Corrosion of Oil Containers. (Zur Frage der Korrosion von Transport- und Lagerfässern der Treib-, Heiz- und Schmieröle.) FRANK. *Erdöl und Teer,* Vol. 8, Jan. 15, 1932, pages 12-13.

Vessels carrying highly refined oils show after relatively short service periods marked corrosion attacks, which require expensive repair work. The writer strongly warns against the utilization of Zn as a protection means for Fe, since galvanized vessels displayed extreme corrosion effects. Oil does not dissolve the artificial resin Bakelite and probably not shellac either. Both products however are rather brittle and show an expansion coefficient different from Fe. EF (4)

The Determination of the Porosity of Tin Coatings on Steel. D. J. MACNAUGHTAN, S. G. CLARK & J. C. PRYTHERCH. *Iron & Steel Industry & British Foundryman,* Vol. 5, June 1932, page 332.

Method of test involves submerging sample in hot water of suitable purity for several hours and examining the number and distribution of very adherent and easily visible rust spots formed at the pores. The pH value of H_2O should be 4.5 to 7, the temperature 95° C. and time of immersion 6 to 8 hours. CHL (4)

Journal Binding—Wire Oxidation. A Microscopical Examination. JAMES SCOTT. *Iron & Steel Industry & British Foundryman,* Vol. 5, Aug. 1932, pages 397-398.

Moisture from paper is stated to cause rusting in steel journal bindings. CHL (4)

Note on the Interaction of Aluminum and Water Vapour. RICHARD SELIGMAN & PERCY WILLIAMS. *Journal Institute of Metals,* Vol. 48, 1932, pages 187-195; *Korrosion und Metallschutz,* Vol. 8, Apr. 1932, page 92; *Engineering,* Vol. 133, Mar. 18, 1932, pages 353-354.

Discussion in *Journal Institute of Metals.* See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 341 EF + LFM (4)

Intercrystalline Corrosion of Duralumin. A. J. SIDERY, K. G. LEWIS & H. SUTTON. *Journal Institute of Metals,* Vol. 48, 1932, pages 165-186; *Korrosion und Metallschutz,* Vol. 8, Apr. 1932, page 93.

Discussion in *Journal Institute of Metals.* See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 343. EF (4)

Total-immersion Tests. F. N. SPELLER, *et al. American Society for Testing Materials Preprint* 12, 1931, pages 6-10.

Tabulated data are given on the failures of sheets of ferrous materials immersed in sea water at the Key West Navy Yard and at the Portsmouth, N. H., Navy Yard. The acid-immersion tests, undertaken to show whether the immersion of Fe and steel sheets in 20% H_2SO_4 gives results comparable to those of atmospheric corrosion tests, show that there is no correlation between these 2 types of tests. The acid test conducted by the procedure followed by the committee is not capable of consistent repetition. The data from such an acid test should not be used to forecast the relative life of ordinary ferrous materials in the atmosphere. Ha (4)

Method of Pretreatment for the Production of Corrosion Resistant Coatings for Difficultly Workable Materials. (Die Vorbehandlungsmethode zur Herstellung korrosionsbeständiger Ueberzüge bei schwer zu verarbeitenden Materialien.) A. STEIN. *Korrosion und Metallschutz,* Vol. 8, Apr. 1932, pages 89-91.

A method of pickling is described which permits electroplating of ferrous alloys which are difficultly plated because of oil, non-homogeneous characteristics, etc. A short treatment of the base metal with a mixture of oxalic acid and HCl followed by a secondary pickle in a mixture of acidulated $FeCl_3$ and $Fe(NO_3)_3$ renders the surface free from impurities and permits the deposition of a uniform coat of metal. BER (4)

Film-reactions. The Corrosion of Metals. (Schichtreaktionen. Zur Frage der Korrosion der Metalle.) LEIF TRONSTAD. *Zeitschrift für Metallkunde,* Vol. 24, Aug. 1932, pages 185-191.

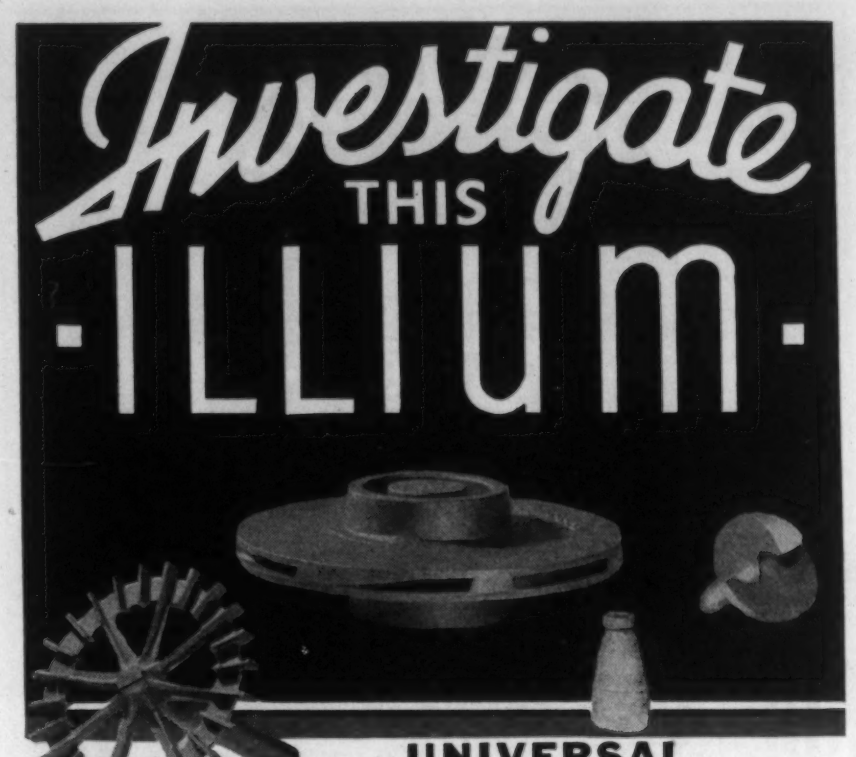
Galvanic cell theories of corrosion are briefly reviewed. It is emphasized that the determining factor is not the potential difference of the primary local elements but the electromotive force of the *reactions* proceeding at the anodes and cathodes. The effect of local elements can best be studied by direct observation under the microscope. Upon the surface of an Al sheet (0.3% Si, 0.3% Fe) were placed drops of 3 gelatine solutions to each of which had been added separate indicators sensitive in the ranges pH 5.4-7.0, 6.1-7.7, 7.0-8.6 and the solutions then neutralized. These solutions slowly attacked the Al sheet, producing (at different rates) first H bubbles at the points of attack and an acid reaction in the medium nearby, and subsequently a precipitate—probably Al hydroxide—and a general etching attack; in no case were alkaline points of attack found. The formation of acid is attributed to inclusions in the Al. Similar observations were made on Fe (0.01% Fe, 0.002% P, 0.036% S, 0.02% Mn) with a phosphate buffer added to the gelatine. In this case gas bubbles were found not to originate at inclusions; the corrosive attack proceeds under the influence of local galvanic cells. RFM (4)

Standardization of Corrosion Tests for Light Alloys. (Normalisation des Essais de Corrosion des Alliages Légers.) *Revue de l'aluminium et de ses applications,* Vol. 9, Jan.-Feb. 1932, pages 1650-1654.

A description of the methods of corrosion testing developed and standardized by the European Aluminum Association. These tests are: (a) Mylius, (b) Modified Mylius, (c) Salt spray, (d) Continuous dipping, (e) Dipping at regular intervals. The Mylius test consists in the measurement of the heat evolved per unit time when the alloy comes in contact with dilute HCl. In the case of metals of a high degree of purity the volume of hydrogen evolved per unit time is measured. The modified Mylius test consists in the measurement of the change in tensile strength and elongation after several different periods of dipping in a solution of 0.5 *N* NaCl in water containing 0.1% of pure H_2O_2. AH (4)

Loosening of Rusted Parts. (Ablösung verrosteter Teile.) *Oberflächentechnik,* Vol. 9, Aug. 16, 1932, page 168.

According to German patent No. 523071 parts which have become so tight by rust that they cannot be loosened and taken off, can be removed easily by applying methylhexaline and other organic solvents obtained by hydration; these penetrate readily into the rusted parts and loosen them. Ha (4)



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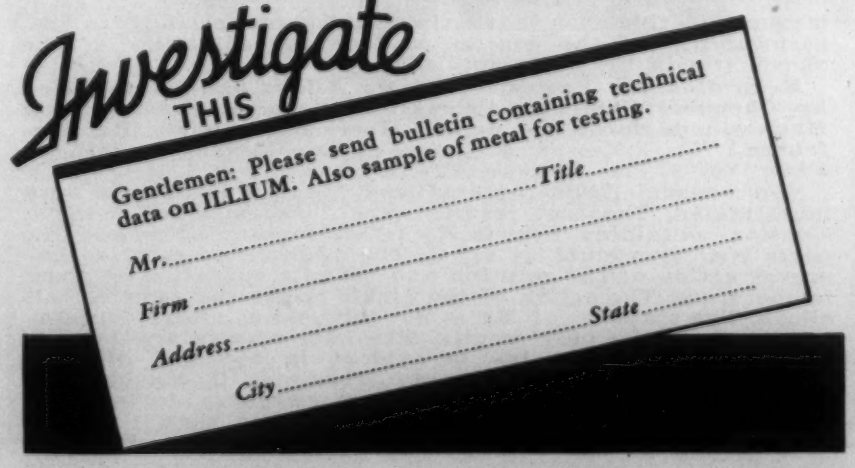

Corrosion Plays a Major Part in the Cooling of Radiators. Wm. H. Wilson. *Automotive Industries,* Vol. 66, Mar. 1932, pages 457-458. Effect of oxidation corrosion on the Fe and steel parts of the automobile cooling system was studied. After a discussion of the theory of corrosive oxidation the writer points out that the same general conditions occur in the corrosion of other cooling system metals such as Cu, solder and brass. Since the corrosion products of these metals are finally precipitated as oxides or hydroxides, the term "corrosive oxidation" has been used. Average corrosion loss in mg./200 hrs./12 in.^{2} area, the test metals not being in electrolytic contact with any other metals, are:

Test Metal	Distilled Water Not aerated	Distilled Water Aerated
Iron	55	580
Solder	5	12
Copper	1	22
Brass	2	28

These and other test data, as well as the theory of corrosion, show that aeration is the greatest single factor involved in cooling-system corrosion and the formation of rust. In the absence of aeration, corrosion of metals can proceed only until a protective film of H_2 is formed, after which the attack is negligible. DTR (4)

Acid Corrosion Resistance of Paint Coatings on Phosphatized Iron. (Die Säurebeständigkeit von Anstrichen auf phosphatiertem Eisen.) Fr. Kolke. *Farben Zeitung,* Vol. 36, Sept. 26, 1931, pages 2235-2238.

Corrosion tests are reported which were made with phosphatized and plain Fe sheets dipped into 6 different lacquers and then exposed to the attack of the following media: acetic acid, H_2SO_4. H_3PO_4 and HCl. Concentration was 3% and the testing times amounted to 24, 48, 72, 120 and 168 hours. Disregarding the results in acetic acid, the durability of acid proof lacquers on phosphatized carriers was not improved but rather impaired. The inferior acid resistance of lacquer coatings on parkerized steel is ascribed to the permeability of the coating and to the solubility of the phosphates in the acids applied. EF (4)

Regarding the Protection of Mg Alloys against Corosion by Chemical Oxidizing Processes. (Ueber den Schutz von Magnesiumlegierungen gegen Korrosion mittels Beizverfahren.) W. O. Kroenig & G. A. Kostylev. *Korrosion und Metallschutz,* Vol. 8, June 1932, pages 147-151.

Numerous methods for oxidizing Mg and its alloys were investigated. The best results were obtained when using a solution containing 4 parts $K_2Cr_2O_7$, 18 parts HNO_3 and 100 parts H_2O by weight at 80° C. The addition of nitrates improves action of the solution and permits operation at room temperature. The action of the pickle is not the same for all alloys. The stability of Mg is not influenced; alloys containing Al show the best results. The best results are for sea H_2O. No practical value is evident in tap and distilled H_2O. The resistance against atm. corrosion is considerably increased. The solution loses its effectiveness during use. 10 liters should be used to treat not more than 1 m.^{2} of surface. BER (4)

Studies on the Influence of Heating Period, Temperature, Gas Velocity and Atmosphere on Iron Loss. (Untersuchungen über den Einfluss von Liegedauer, Temperatur, Gasgeschwindigkeit und Atmosphäre auf den Eisenabbrand.) Wilhelm Schroeder. *Archiv für das Eisenhüttenwesen,* Vol. 6, Aug. 1932, pages 47-54.

Report 166 of Heat Section of Verein deutscher Eisenhüttenleute. Losses on heating were determined in a test pusher furnace 360 x 360 x 400 mm. heated with different fuels, illuminating gas, oil, or coke. Ingot steel of uniform composition, containing 0.34% C, 0.28% Si, 0.87% Mn, 0.07% P and 0.005% S was used for the charge, and dimensions of the ingots were 25 x 25 x 60 mm. Temperature range explored was 900° to 1100° C. Test results were plotted on a series of curves for the different factors studied. The most important results are summarized herewith. Temperature strongly influences the amount of loss on heating. A temperature rise from 900° to 950° C. gave a 25% higher loss. With a rise from 900° to 1000° C. the loss was 100% higher. The Fe loss on heating is small up to a temperature of 900° C. on the top surface of the ingot. In the operation of a pusher furnace it is evident that a rapid rise of ingot surface temperature up to 900° C. is desirable, providing that this procedure is possible without producing cracks in the ingots. A considerable difference lies in the kind of furnace atmosphere, be it oxidizing or reducing. Above 900° C. a reducing atmosphere should be used by all means. Illuminating gas, with its high water vapor content (21.2%), and excess air gives better ignition than coke with high CO_2-content (20.5%). From this it follows that water vapor or steam gives a stronger oxidizing action than CO_2. On the other hand illuminating gas with insufficient amount of air decreases the loss more than does coke, which is to be attributed to the stronger reducing action of H as against that of CO. Thus illuminating gas is the best fuel to use, since with its high percentage of H, even with small air deficiency, it yields the lowest losses. If a reducing flame is maintained on the principal burner of a pusher furnace, the unburned gases must be burned afterwards in the back part of the furnace by means of supplementary air or an added burner. In this event not only fuel losses are avoided, but also an ignition layer is set up with an oxidizing atmosphere in the back of the furnace surrounding the ingot, which in opposition to a reducing atmosphere adheres very loosely and the top surface of the charge does not become rough. Then the reducing atmosphere of the main burner can no longer cause any breaking down of the smooth surface of the charge. The benefits of the 2 methods, (1) excess air—smooth surface of the furnace charge, and (2) lack of air—small Fe loss—are tied up with each other. The various positions of the ingot sides to direction of the flame, flame radiation, or within the zone of the flame are all without effect on the loss during heating. The loss in g./cm.^{2} for surfaces surrounded by gases is the same for all sides. A varying rate of flow of waste gases does not affect the loss. DTR (4)

Contribution of the Knowledge of the Protective Action of the Oxide Films Formed on Steel by Scaling. (Beitrag zur Kenntnis der Schutzwirkung der beim Zundern auf Stahl gebildeten Oxydschichten.) Hjalmar von Schwarze. *Mitteilungen aus dem Forschungsinstitut der Vereinigte Stahlwerke Aktiengesellschaft Dortmund,* Vol. 2, No. 12, 1932, pages 263-277.

The object of this investigation was to find the conditions under which steels at high temperatures form on their surface such oxide film that scaling is effectively prevented. The oxidizing velocity was determined by means of the temper colors; the thickness of the oxide film and composition of the scale was examined. The ternary system Fe-Cr-Al was investigated up to 20% of each component with regard to scaling up to 1200° C. 2 different forms of scale were observed: white scale, which is very dense, adheres firmly and protects well against further scaling, and black scale which does not protect. The Al and Cr content determine which kind of scale is formed, pure Al alloys or those with predominant Al content form white scale. This scale consists mainly of alumina and protects even in very thin films; steels with white scale remain practically unchanged at very high temperatures and can be used as heat-proof steels. Black scale consists mainly of Cr and Fe oxides. Higher Cr contents give a protection but to a much lesser degree than the Al steels, and the protective action is good only up to 900° C. Test methods, ternary diagrams and results are described in full and the analyses of steels investigated are given. Ha (4)

The Effect of Hydrogen Sulphide on the Corrosion of Iron by Salt Solutions. S. C. Britton, T. P. Hoar & U. R. Evans. *Iron & Steel Institute, Advance Copy* No. 2, Sept. 1932, 9 pages.

Small additions of H_2S or Na_2S (less than 5 parts per million) added to KCl solution accelerated the total attack of electrolytic Fe and mild steel partially immersed. A study of the mechanism of attack indicated that the increased general attack was due to a stimulation of the anodic reaction. The intensity of attack was diminished by the sulphide because the area of attack was extended. 11 references. JLG (4)

Corrosion and Nucleus Formation. (Korrosion und Keimbildung.) H. Cassel. *Korrosion und Metallschutz,* Vol. 8, May 1932, pages 113-115.

A theoretical discussion of the probable importance of nucleus formation on anodic and cathodic reactions and the rapidity of metal dissolution. No experimental data. BER (4)

The Rate of Solution of Thallium in Acids. (Lösungsgeschwindigkeit des Thalliums in Säuren.) M. Centnerszwer. *Zeitschrift für Elektrochemie,* Vol. 37, Aug-Sept. 1931, pages 603-610.

Tl dissolves readily in HNO_3 with little generation of H_2. After an induction period, the rate of solution proceeds according to Boguski's rule. The rate of solution increases with increasing strength of HNO_3 to 0.25 *N* and then decreases. The temperature coefficient increases with temperature. Tl dissolves slowly in H_2SO_4 and in HCl. The rate of solution is nearly independent of the acid concentration. The rates of solution in 2 *N* HNO_3, H_2SO_4 and HCl are 428: 1.78:1 respectively. Ha (4)

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Corrosion of Lead. Its Causes and Remedies. *Electrical West.* Vol. 68, May 15, 1932, pages 457-461.

Report of Subcommittee on Lead Corrosion Underground Systems Committee, Engineering Section, Pacific Coast Electrical Association, dealing with a laboratory investigation of chemical corrosion of Pb. Describes method of testing and tabulates various tests. These were made to conform as nearly as possible to practical field conditions. Observations made upon surface exposed to air indicate that mechanically stressed Pb shows increased corrosion. Direct current corrodes Pb readily, the Pb becoming charged like storage-battery plates. Tests show that use of bare Cu neutrals and bare Cu wire for cross-bonding in water-filled manholes is conducive to corrosion. At end of 2 months, galvanic current between a Cu and a Pb electrode, each 18" long and 1" in diameter and half submerged in electrolytic H_2O was 0.7 milliamp. This would prove quite destructive. At end of 2 months galvanic potential between Fe and Pb was 0.04 volts and 0.25 milliamp., in favor of the Pb. For the same period, galvanic potential for Zn to Pb was 0.13 volts and 0.75 milliamp., in favor of Pb. Tests are still in progress. MS (4)

Corrosion of Tin Plate by Greened Food Products. (Korrosion des Weissbleches bei gegrünten Konserven.) P. Nehring & E. Nehring. *Konserven-Industrie,* Vol. 18, Mar. 1931, pages 199-201; Apr. 1931, pages 214-215.

Experiments were carried out to throw light upon the frequently encountered corrosion of cans used for greened food products. It was established that the corrosion of the lacquered and unlacquered tin plate is due to the addition of $CuSO_4$ which is required for the greening process. The Cu attacks the tin plate. Pitted areas are developing and the Fe is exposed. Either the remaining Cu or the fruit acids present will cause rapid perforation of the Fe. EF (4)

Discussion on the Corrosion Theory. (Erörterungen zur Theorie der Korrosion.) E. Liebreich. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 160, June 1932, pages 211-224.

Pursuing previously published research work a series of new tests yielded evidence against the differential aeration theory of Evans. All experiments indicate that, on account of the effect of local elements, the corrosion products originated determine the corrosion appearance irrespective of the enobling action of O_2. With respect to the corrosion of plates partly or wholly submerged in liquids, an O_2 concentration gradient along the plate does not play any role. Especially in case of partly submerged plates, the reason for the more pronounced unattacked zone is not the greater amount of aeration, but the current phenomena. The surface tension probably exerts an additional influence. In an atmosphere saturated with water vapor and containing O_2 no central corrosion spot occurs in the drop test if the experiment is carried out in such a manner that the drop does not spread out. Stirring of the liquid also does not produce a central etching picture on Fe plates. Only the course of the corrosion products determines the appearance of the corrosion picture. EF (4)

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STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Recrystallization and Crystal Recovery after Cold-Working of Pure Aluminum and Several Age-Hardening Aluminum Alloys of an Aluminum-Copper Base. (Ueber die Rekristallisation und Kristallerholung von Rein-aluminium und einigen aushärtbaren Aluminiumlegierungen auf Al-Cu-Basis nach Kaltverformung.) H. Bohner & R. Vogel. *Zeitschrift für Metallkunde,* Vol. 24, Aug. 1932, pages 169-175. The following alloys were studied: pure Al, 0.19% Si, 0.23% Fe; (I) 1.09% Si, 0.24% Fe, 4.29% Cu, 0.55% Mn; (II) 0.18% Si, 0.23% Fe, 5.56% Cu, 0.61% Mn; (III) 0.50% Si, 0.22% Fe, 4.21% Cu, 0.43% Mn, 0.45% Mg; (IV) 2.23% Si, 0.40% Fe, 4.20% Cu. In pure Al critical grain growth takes place at 1.5% cold-rolling on heating to 500° C. for 20 min.; for alloy I at 5%, alloy II at 6%, alloy III at 5%, alloy IV at 2%. Al recrystallizes (after cold-rolling) at the lowest temperatures, then follow in order of higher temperatures, alloys IV, I and III, II. Recrystallization depends not only upon chemical composition, heating temperature, time of heating, but also upon the thermal and mechanical treatment prior to recrystallization, as temperature of deformation, type of deformation, deformation velocity, degree of deformation, and by the size and orientation of the original grains. Under certain conditions the surface offers greater resistance to recrystallization than the interior. The range of "critical grain-growth" is greater in pure Al than in the Al-Cu alloys studied; increase in Si in the Al-Cu alloys lowers the recrystallization temperature and the critical deformation. Increase in Mg has no effect whereas increase in Mn increases the critical deformation. Lüder lines, observed in the Al-Cu alloys, act as seats for recrystallization, giving recrystallized grains oriented along the Lüder lines. Crystal recovery is dependent upon the thermal and mechanical treatment prior to deformation and can be influenced by small variations in composition. RFM (5a)

Prevention of Recrystallization by a Preliminary Short Annealing. A. A. Bochvar. *Tzvetnuie Metallui,* No. 5, May 1931, pages 587-594. The author investigated the effect of preliminary short annealing on grain growth after cold deformation in metals which in service are liable to heating above recrystallization temperatures. The tests were made on 2 grades of Sn, 99.8 and 99.9 pure. First, the rate of grain growth of cold worked samples (Brinell impressions) was determined at temperatures from 100° to 180° C. In the second set of experiments the cold worked samples were first given a short anneal and then heated for a long time at temperatures slightly lower than the preliminary anneal. It was found that a preliminary anneal for a few seconds at temperatures 15° C. or more higher than the (possible service) temperature of the long annealing is sufficient to prevent any further appreciable grain growth. The grain size after preliminary annealing was found to increase somewhat, but it always was less than that of specimens heated for a long time without the preliminary anneal. Heating for 2 - 10 seconds at 165° or 180° C. was found sufficient to prevent further grain growth at 150° C. These results were verified by further experiments. Detailed data are given in tables, graphs and photographs. BND (5a)

On the Rates of Reactions in Solid Steel. Edgar C. Bain. *Transactions American Institute Mining & Metallurgical Engineers, Iron & Steel Division,* Vol. 100, 1932, pages 13-46. This is the Ninth Annual Henry Marion Howe Lecture, delivered in Feb. 1932. Previously reported work had shown that in C and low-alloy steels the rate of decomposition of austenite was a maximum between 600° and 500° C. Rates of reaction were determined by microscopic examination of quenched samples or by the dilatometer. Decomposition-time curves are shown for several Mn steels containing 0.55% C at temperatures of 525° and 315° C. Also for Ni steels containing 0.55% C at 480° and 315° C. The rate of reaction decreased rapidly as the temperature was lowered. The decomposition-time curves closely agree with "first-order reaction curves" except that they are shifted forward along the time axis, the rate is not a maximum for zero decomposition, and all austenite is decomposed in finite time. Increased amounts of Mn and Ni decreased the rate of decomposition, but Mn was much more effective in this respect than Ni. Austenite, ferrite and carbide were found to be stable in some alloys in a certain temperature range as proved by the decomposition-time curves and by microstructures of pearlitic and austenitic samples of the same steel held in this range. In some of the Ni steels graphite and not carbide was the end product, but in all cases cementite first formed and then was converted to graphite, provided any graphite was formed. An austenitic Mn steel was partially transformed to martensite by cooling in liquid air. On reheating this steel to 525° C. the carbides were immediately precipitated from the martensite, while many hrs. were required for appreciable decomposition of the austenite. As this experiment proved that the rate of decomposition of martensite at elevated temperatures was much greater than the rate of transformation of the austenite, it was concluded that martensite was *not* an intermediate stage in the formation of pearlite. Carbide absorption rates at quenching temperatures and the rates of carbide growth at tempering temperatures are briefly discussed. JLG (5a)

The Use of Polarized Light in the Study of Metal Sections. (Über die nutzanwendung des polarisierten Lichtes bei der Untersuchung von Metallschliffen.) M. F. von Schwarz. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 508-517. Striking micrographs of Si Cu, Cu P and other alloys showing the same fields with ordinary illumination and with polarized light. Details of structure not revealed by ordinary light come out when crossed nichols are used. Characteristic colors are shown by different phases, as is illustrated by a couple of color photographs. See also "The Micro-optical Investigation of Non-ferrous Alloys by Polarized Light," *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 239. HWG (5a)

The System Iron-Cobalt-Carbon. (Das System Eisen-Kobalt-Kohlenstoff.) Rudolf Vogel & Werner Sundermann. *Archiv für das Eisenhüttenwesen,* Vol. 6, July 1932, pages 35-38. The phase diagram for Fe-Co alloys with amounts of C up to 5% was studied by the usual cooling curves, structure examinations, and magnetometric measurements. 3 classes of crystals separate out: ternary α-solid solution, ternary γ-solid solution and graphite. Primary cementite precipitation was not found for the rates of cooling used, 1° to 2°/sec. The eutectic consisted of ternary solid solution and cementite or graphite. The ranges, in which the cementite or graphite eutectics occur, were divided by a transition zone, in which both phases existed in common. Alloys in this range of concentration easily change over from the graphitic to the cementitic solidification through slight variations in the rate of cooling or in the pressure. These conditions are well known in the case of reversible chilled castings. The relation of the hardness characteristic of Co-steels to their composition was determined for a definite rate of cooling. The transformations in the solid state for alloys up to 80% Co finally produces pearlite, which consists of binary α-solid solution and cementite or graphite. The γ-solid solution is stable down to room temperature for the samples containing 80 to 94% Co. The magnetic transformation of Fe is caused to take place at higher temperatures by Co. The magnetic conversion was observed in alloys up to 70% Co. For alloys up to 10% Co and 2% C the range within which martensite occurs was determined for a cooling rate of 65°/sec. Austenite, sorbite and troosite were not observed. DTR (5a)

Mechanical and Magnetic Precipitation Hardness of Iron-Cobalt-Tungsten and Iron-Cobalt-Molybdenum Alloys. (Mechanische und Magnetische Ausscheidungshärtung der Eisen-Kobalt-Wolfram- und Eisen-Kobalt-Molybdän-Legierungen.) Werner Köster. *Archiv für das Eisenhüttenwesen,* Vol. 6, July 1932, pages 17-23. Report 181 of Committee on Materials of Verein deutscher Eisenhüttenleute. In the investigation of Fe-Co alloys with increasing additions of W or Mo, it was demonstrated that the variation in hardness with the annealing temperatures depends on the original structure of the alloy, that is, whether it is a representative ferrite, austenite or martensite type. By noting the change in specific gravity, electrical conductivity, and magnetic saturation it was observed that the annealing process for ferrite and austenite alloys depended solely on the precipitating out of supersaturated solid solutions of the series Fe_3W_2-CoW or Fe_3Mo_2-CoMo. In the case of martensite alloys there occurred the added transformation of residual austenite, which was established at temperatures somewhat lower than the precipitation. The hardening of ferrite alloys is accelerated if supersaturated α-solid solution is produced by cooling from the γ-phase. The hardness numbers increase for all 3 structure states with increasing amounts of Co, W, or Mo. The hardness was measured up to 70 on the Rockwell-C-scale. The magnetic hardening of α-alloys produced in the course of separation takes place at only slightly higher temperatures than the mechanical hardening. Widening of the induction loop involves appreciable changes. In the maximum case a rise in coercive force was observed 75 times higher than its value in the cooled condition. The coercive force in this case was 350 Oersted at 7300 gausses remanence. With increasing amounts of W, Mo and Co, the coercive force increased. Remanence decreased with increasing W or Mo, and increased with increasing Co. The martensite alloys after being hardened by precipitation are suitable as cutting and machining alloys, the ferrite alloys as permanent magnets. Due to their special metallographical differences from alloyed C steels, together with their particular properties already outlined, new fields are opened up for these C-free alloys in the manufacture and use of cutting tools and permanent magnets. DTR (5a)

On the Structural Constituents of Chromium Steels. Takejiro Murakami & Kazue Hatsuta. *Tetsu to Hagane,* Vol. 18, Apr. 1932, pages 399-405. In low Cr-high C steels, the magnetic transformation below 200° C. takes place in 2 steps, which were previously attributed to existence of 2 carbides, i.e., cementite and α-double carbide by one of the present writers. By annealing and slow cooling the specimens, the change takes place in one step. This transformation temperature in well annealed specimens, gradually decreases, as the Cr content increases. The corrodibility of the carbide existing in low Cr steels by boiling picrate solution gradually decreases, as the Cr content increases. From these facts it is concluded that the Cr dissolves in cementite forming a θ-solid solution, and the α-carbide is not a double carbide. β-carbide previously proposed by one of the present writers is also the θ-phase dissolving much Cr and not a double carbide. The corrodibility of carbides by several etching reagents, and the X-ray spectrum of carbides in many alloys of this system were investigated. In this system there exist 2 other carbides, η- and ε-phases, besides θ-phase, above described. The η- and ε-phases are solid solutions dissolving Fe in trigonal and cubic carbides, Cr_7C_3 and Cr_4C, respectively and not double carbide, confirming the view of Westgren, etc. From these results a constitutional diagram at the room temperature showing the fields in which several phases exist was constructed, that of Westgren, etc. being somewhat modified. TM (5a)

The Growth of Austenite above Ac_1 in Plain Carbon Steels. J. H. Whiteley. *Iron & Steel Institute, Advance Copy* No. 13, Sept. 1932, 12 pages. Hypo-eutectoid steels were heated to various temperatures between Ac_1 and Ac_3 and quenched in order to determine the structure at that temperature. Austenite when formed at isolated areas tends to surround the untransformed ferrite, leaving islands of ferrite in a groundmass of austenite. The slower the rate of heating the greater the tendency for the austenite to surround the ferrite. Mn decreases the tendency of the austenite to surround the ferrite grains. The movement is modified and may be suppressed by a banded structure. The extent of the movement is increased by repeated heatings, provided the intermediate coolings are not too slow. The formation of the austenite film causes a drop in the impact value after the steel has been cooled to room temperature. JLG (5a)

Heat Treatment of Ternary Alloys Containing Gold and Nickel. J. S. SHELL. *Journal American Dental Association,* Vol. 18, Aug. 1931, pages 1541-1544. Ni-Au alloys consist, after quenching from 900° C., of homogeneous solid solutions, which disintegrate eutectically after 24 hours annealing at about 420° C. The addition of Cu, Co, or Fe to Ni-Au alloys of medium concentration shifts the disintegration temperatures; this can be of importance for the application of the white gold alloys in dentistry. Ha (5a)

The Kinetics of the Transformation of Austenite. I. Magnetic Studies of Austenite Decomposition. (Zur Umwandlungskinetik des Austenits. I. Magnetische Untersuchungen des Austenitzerfalles.) FRANZ WEVER & HEINRICH LANGE. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, Report 201, 1932, pages 71-84. The transformation of 2 Cr-Ni-steels containing 0.35 and 0.50% C was studied with an improved Wever and Lange magnetometer furnace, the original hookup being outlined in *Mitteilungen Kaiser Wilhelm Institut für Eisenforschung,* Vol. 12, 1930, page 353. The conversion of austenite was determined by the GP- and GS- lines of the equilibrium diagram and their prolongations at low temperatures. The transformation took place in 3 well defined and separate temperature stages. In the first stage between 650° and 500° C. the transformation reactions occurred in a sequence similar to that for slow cooling. In the beginning of the first stage, ferrite alone is precipitated, whereby the C-content of the austenite is increased up to the eutectoid composition. Finally the pearlite conversion sets in and the transformation is terminated. In the second stage between 500° and 120° C., the austenite loses its ability to yield cementite in direct formation. At first the austenite precipitates out supersaturated ferrite, the composition of which is given by the extension or prolongation of the GP-line. This ferrite however breaks down very rapidly into stable, practically C-free ferrite and cementite, which as a nucleus indirectly produces cementite separation from the austenite. In the lower part of the second stage no further cementite is formed from the ferrite on account of insufficient diffusion, while coincident with this the activity for cementite precipitation from austenite is halted. In this temperature stage the C is converted into a form which as yet is unknown, and which is converted by annealing into cementite. In the third stage the austenite is converted into the intermediate form of tetragonal martensite without any alteration in composition, this form being nothing more than the supersaturated ferrite. The precipitation of supersaturated ferrite in the second and third zones always gives a formation of needles. These needles retain their external shape at temperatures below 350° C. for so long a time, that they are actually made visible in structure. However at temperatures above the martensite-point they break down always into the cubical ferrite and cementite or the as yet unknown structure form of C. In the third stage only these needles retain their original tetragonal shape. Upon annealing they are converted readily into the more stable cubical shape along with precipitation of C. 8 references. DTR (5a)

On the Types of Fractures of Metals and Alloys: Part I. Pure Metals and Mono-phase Alloys. ICHIRO IITAKA. *Tetsu to Hagane,* Vol. 18, May 1932, pages 480-489. Fractures of metals and alloys are technically very important. They differ from each other both as to kinds of materials and applied forces. The writer has classified all these fractures into 4 types according to the path and mechanism of rupture. The types for poly-phase alloys may be considered as combinations of those for mono-phase ones. Type 1. Transgranular. Separation occurs along cleavage planes or "Spalt-fläche." Fineness of fracture coincides with grain size. Very rough fracture. Type 2. Transgranular. Slipping occurs along slip planes. Fracture is generally very much finer than grain size, fineness is equal with slip band size. Very fine fracture. Type 3. Transgranular. Breaking occurs along dendrite boundaries. Fineness is quite indifferent to grain size and coincides with dendrite size. Very fine fracture. Type 4. Intergranular. An abnormal fracture breaking along grain boundaries. Fineness coincides with grain size. Very rough fracture. Type 3 was discovered by his experiments. Many common metals and alloys belong to this type, other 3 types being met with rather in rare cases. The reasons for proposing the new type are described in this paper. Test pieces were always broken by bending with shock force. Fractures, when viewed by the naked eye, give a feeling of fineness or roughness which of course is due to the zigzags on the surface. The characteristic features of type 3 are as follows: (a) The width of zigzags which determines the fineness is far smaller than grains but of equal size with dendrites. The fineness of fracture in natural size of α brass is smaller than 1-1/10 mm. The grains are 1 mm. or so wide and 10 mm. or more long while the dendrites are about 1/30 mm. thick and correspond just to the zigzags of the fracture. (b) The path of fracture runs mostly along the trunks and big branches of dendrites, and even when the force acts so as to cross them they project (or sink) a little resulting in both cases the unevennesses of their sizes on the fracture. (c) Dendrites are revealed in most fractured surfaces and contribute directly to the feeling of fineness. They are of equal size with the dendrites shown in the photomicrographs of the polished and etched surfaces. (d) Is the grain size proportional to the dendrite size and consequently proportional also to fineness? That the answer is negative and the fineness is quite independent of grain size was proved by photomicrographs of gun metal ingots cast at various temperatures. Even the specimens of the same grain size give quite different finenesses when the dendrite sizes are different. Besides, specimens of larger grains have finer fracture than specimens of smaller grains when the dendrites of the former are smaller. That the fracture is exceedingly fine as compared with grain size was clearly proved by many photographs. Fracture of large dendrites is coarse and that of small ones is fine. Even different alloys are of the same fineness when their dendrite sizes are equal. These results were confirmed on fractures of steels, various Cu alloys, etc. TS (5a)

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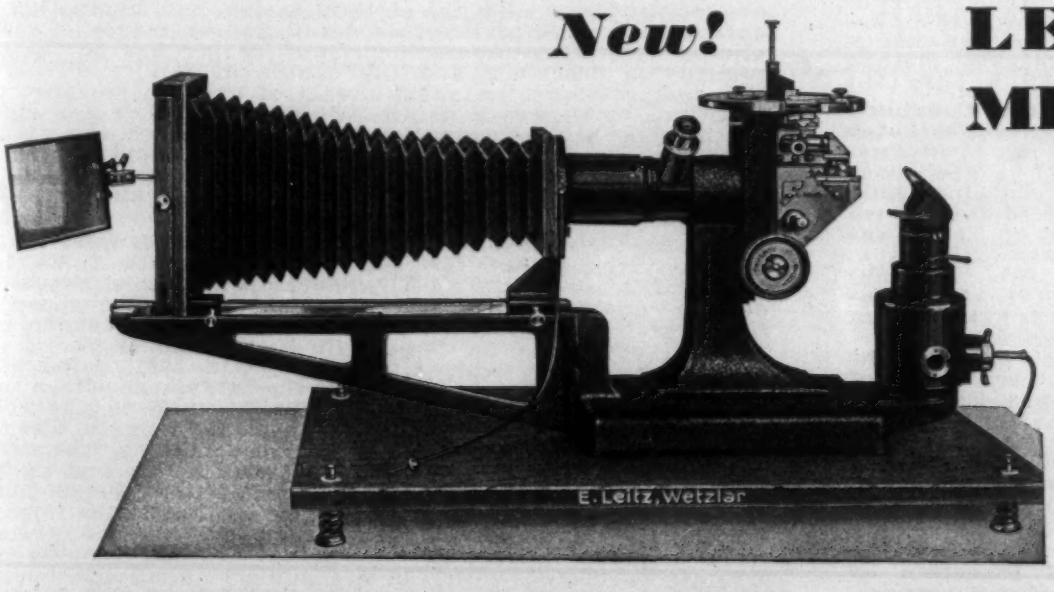

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Investigations on the Iron-Oxygen System. (Untersuchungen über das System Eisen-Sauerstoff.) H. SCHENCK & E. HENGLER. *Mitteilungen aus dem Institut für Eisenhüttenkunde der technischen Hochschule zu Aachen*, Vol. 11, 1932, 6 pages. See *Metals & Alloys*, Vol. 3, July 1932, page MA 204. Ha (5a)

Advances in Microscopy. F. F. LUCAS. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 422-444. Common metals absorb so much and reflect so little ultra-violet light that the hopes for greatly improved resolving power by its use have not been fully realized for metallography. Much information in previous publications of Lucas is again given in this article and the 3500 diameter micrographs of martensite, etc. that have appeared in those publications are reproduced. HWG (5a)

The Kinetics of the Transformation of Austenite. II. Dilatometric Studies of Austenite Decomposition. (Zur Umwandlungskinetik des Austenits. II. Dilatometrische Untersuchungen des Austenitzerfalles.) FRANZ WEVER & WERNER JELLINGHAUS. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, Report 202, 1932, pages 85-89. The transformation of a Cr-Ni Steel containing 0.35% C was studied with a modified P. Chevenard differential dilatometer. Results are tabulated for 22 tests giving the rates of transformation and the changes in length of austenite at temperatures varying from 728 to 130° C. At 728 and 660° no conversion was observed in a period of 2 hrs. At 614° C. this change in structure was first evidenced by change in length of test steel. The results plainly corroborate Wever and Lange's magnetic studies on austenite decomposition. Again it was observed that the transformation occurs regularly in 3 well defined temperature stages. Time-elongation curves are shown for various temperatures. 8 references. DTR (5a)

Veining or Sub-boundary Structures. L. NORTHCOTT. *Iron & Steel Institute, Advance Copy* No. 10, Sept. 1932, 13 pages. Veining net work was observed in mild steel, wrought Fe, cast Ni, and cast Cu, but not in electrolytically deposited Fe, Ni or Cu. Veining can be removed by quenching from a high temperature. It can also be removed from the surface layers of steel by annealing in H. It is promoted by annealing in air. By certain heat treatments the particles causing the veining can be made to agglomerate. The observations indicated that veining was due to oxide inclusions. They also indicated that the solubility of O in γ Fe was greater than in α Fe, and that the solubility in α Fe decreased with decreasing temperature. The possible influence of O on aging phenomena is discussed and it is concluded that O is not responsible for aging at room temperature as veining is only affected by heating several 100° above room temperature. 8 references. JLG (5a)

Structure and X-Ray Analysis (5b)

Thermal Behavior of Certain Solid Solutions. E. L. NICHOLS & MARY A. EWER. *Journal Optical Society of America*, Vol. 22, Aug. 1932, pages 456-465. Some materials, notably Tb, Pr, U, Eu, showed a certain flash effect when a flame heating the substance was withdrawn. This occurred a definite time after the withdrawal of the flame. This glow took place, however, only if some activating material was present. The spectrum of the flash was investigated; the bands lay generally between 0.510 μ and 0.050 μ. The cause of the phenomenon must be ascribed very likely to a gradual change in the crystalline arrangement of the material. The method of investigation is described in detail. Ha (5b)

Precision Determinations of the Space Lattice Constants of Beryllium. (Präzisionsbestimmung der Gitterkonstanten von Beryllium.) M. C. NEUBURGER. *Zeitschrift für physikalische Chemie*, Abt. B, Vol. 17, June 1932, pages 285-292. The space lattice dimensions of highly pure Be which contained only traces of Fe, Ba and C (spectroscope) were re-determined by X-ray powder photographs. An accuracy of 0.01% was ascertained due to the utilization of Reglers' calibration method (See *Metals & Alloys*, Vol. 3, page MA 266). EF (5b)

X-ray Interferences on Liquids. Hg, Ga, CCl_4. (Röntgeninterferenzen an Flüssigkeiten. Hg, Ga, CCl_4.) H. MENKE. *Physikalische Zeitschrift*, Vol. 33, Aug. 15, 1932, pages 593-604. The theoretical part of the subject is treated under the following heads: (I) Coherent and incoherent scattering of a single atom; (II) Scattering of liquids composed of single atoms: (III) Scattering of liquid CCl_4. Then the experimental equipment is described in full detail. The X-ray photographs of liquid Hg show distinct minima and maxima in almost periodical succession. Similar intensity curves were gained on Ga, which was studied at 45° C. and in an under-cooled liquid state at 18° C. The m.p. of Ga is 30° C. EF (5b)

X-Ray Investigation for the Change of Direction of Crystal Axes During an Allotropic Change of a Substance. HIKOROKU SHOJI. *Kinzoku no Kenkyu*, Japan, Vol. 9, July 1932, pages 292-294. It was experimentally shown that by the transformation of α-iron $\rightarrow \gamma$ Fe a deviation of about 20° from the case found by Kurdjumow & Sachs may occur and the degree of the rotation of the lattice as a whole is different in each case and also that when Fe is transformed from α into γ modification the lattice of the latter has, when cooled, a tendency to return back to that of the former in its initial orientation. KT (5b)

Diffusion and Decomposition in Solid Solutions. (Zur Diffusion und Entmischung in Mischkristallen.) A. SMEKAL. *Zeitschrift für Metallkunde*, Vol. 24, June 1932, pages 121-124. Theoretical considerations on this subject by Hanemann and Schröder (*Zeitschrift für Metallkunde*, Vol. 23, 1931, pages 269, 297) are criticized and amplified. The assumption of "perfusion directions" by them is discredited; the difference in precipitation velocities in substitutional and interstitial solid solutions is explained simply by differences in diffusion velocities. The volume change accompanying precipitation is held to produce strains along certain lattice planes (slip, shear, cleavage, fracture) which initiate precipitation and thus lead to the formation of lamellar precipitate forms. It is suggested that such strains may be detected by the reflection of polarized light. See next abstract. RFM (5b)

Addendum to article by A. Smekal entitled "Diffusion and Decomposition in Solid Solutions." (Kurzer Beitrag zu der vorstehenden Arbeit von A. Smekal "Zur Diffusion und Entmischung in Mischkristallen.") M. v. SCHWARZ. *Zeitschrift für Metallkunde*, Vol. 24, July 1932, pages 124-126. The presence of internal strains induced by precipitation have been demonstrated by the reflection of polarized light (cf. M.v. Schwarz. *Zeitschrift für Metallkunde*, Vol. 24, 1932, page 97) from the polished and etched surfaces of Cu-Si alloys. Photomicrographs are given (4 in color) showing that an alloy with 0.85% Si, which does not form a precipitate on cooling, gives no indication of internal strain (uniform color in each grain under the polarizing microscope); that an alloy with 3.5% Cu precipitating β crystals on cooling shows color variations in the neighborhood of precipitated β crystals, indicating a strain accompanying precipitation in the supersaturated matrix. The indications of internal strain are greater in an alloy with 4.6% Si. Strains introduced by polishing are confusing and very deep etching to remove the polishing film produces etch pits and leads to disturbing etchpit reflections; polishing must be very light so that a weak etch will remove the polishing film. RFM (5b)

On the X-Ray Determination of Stresses in Welds. JOHN T. NORTON. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 5-7. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 4, 1932. An explanation of the X-ray diffraction method of determining grain size, grain orientation and presence of internal stresses in metals. Photograms of weld metal having deformed grains show pronounced asterism. It is suggested that this method may be used advantageously in the investigation of physical properties of weld metal. TEJ (5b)

Stresses in Technical Work Pieces and Its Detection by X-Rays. (Spannungen in technischen Werkstücken und ihr röntgenographischer Nachweis.) FRITZ REGLER. *Zeitschrift des Österreichischen Ingenieur-und Architektenvereins*, Vol. 84, Aug. 26, 1932, pages 171-174. The so-called cone-reflection method developed by the author for the determination of internal stresses is described. The method offers a considerable experimental simplification over other methods including that recently described by Wever & Möller. (*Metals & Alloys*, Vol. 3, Aug. 1932, page MA 240). In straight C steels a measuring accuracy of $\pm$ .1 kg./mm.^{2} could be attained up to the yield point. The method was devised on the basis of the assumption that cold working and quenching bring about twists of the space lattice and bending slip, so that these 2 occurrences can be used for quantitative stress measurement. It is suitable for any type of steel and seems to be particularly adaptable to testing stresses in bridges, steel constructions, gas bottles, etc. GN (5b)

Technical X-Ray Photographs and their Evaluation. (Technische Röntgenbilder und ihre Auswertung.) W. GRIMM & F. WULFF. *Autogene Metallbearbeitung*, Vol. 25, July 15, 1932, pages 217-221; Aug. 1, 1932, pages 232-237. The differences in the picture taken on a screen or on a photographic film are pointed out and the determination and evaluation of defects is explained in great detail and by means of many photographs. The arrangement and proper use of the apparatus is described and the causes of failure discussed. The composition of a substance is of great importance for the time of exposure as the alloying materials for steels all have a higher atomic weight. The higher the atomic weight the greater the absorption of X-rays, and the longer the time of exposure necessary. A photograph shows the blackening of the plate for Al, cast Fe, steel and Cu under the same conditions of radiation. Ha (5b)

The Ag-Cu-Zn System. (Das System Silber-Kupfer-Zink.) M. KLEINERT. *Zeitschrift für physikalische Chemie*, Abt. A, Vol. 160, May 1932, pages 15-33. The paper opens with a discussion on the binary diagrams Ag-Zn and Cu-Zn. The constitutional system Ag-Cu was discussed in a previous publication of the author on the Ag-Cu-Mn system (*Zeitschrift für physikalische Chemie*, Abt. A, Vol. 156, Oct. 1931, pages 291-303.) All melts of the ternary Ag-Cu-Zn system, which was studied metallographically, are miscible and in the solid state crystallographic phases only occur which are already known from the binary systems. Corresponding to the striking analogy between the binary systems Ag-Zn and Cu-Zn, formation of complete solid solutions of the corresponding types of crystals (β, γ, ϵ) takes place so that in the ternary system, the analogous couples become one kind of crystals from a phase-theoretical viewpoint. The Zn bearing Ag crystals saturated with Cu, are subject to age-hardening. With regard to the Zn corner, the Zn solid solution η, holds about 4% Cu and 3% Ag in solid solution. At higher Cu and Ag concentrations, the ϵ phase appears. Both γ phases of the Cu-Zn and Ag-Zn diagram form a continuous series of solid solutions. The δ phase, only stable at elevated temperatures, is enclosed by the γ and ϵ field. Regarding the corresponding β crystals, a complete analogy of the space lattice was ascertained by X-rays as well as the occurrence of an intermetallic compound at about 50 atomic %. The micro examinations confirmed the isomorphy of the β phases. The β' crystals show traces of a eutectoid decomposition, as if both phases β'-Cu-Zn and β'-Ag-Zn are separately originated from the β crystals and form a eutectoid mixture. The extent and equilibria of the α solid solution (α-Cu and α-Ag solid solution) among one another and with the β and β' phases are investigated only roughly. An addition of Zn to the Ag Cu phase does not result in a complete mutual solid solution formation unless the saturation of both α crystals with Zn is attained. Two different α phases occur. Since the saturation limit of the Ag crystals with Cu drops with falling temperatures, age-hardening tests were made. The publication concludes with a detailed critical discussion of a previous investigation of Ueno on the Ag-Cu-Zn system (*Memoirs College of Science, Kyoto Imperial University*, Vol. 12, No. 6, 1929) which was laid out on the basis of thermal analyses. EF (5b)

Note on Article "Diffusion and Decomposition in Solid Solutions." (Zuschrift Zur Diffusion und Entmischung in Mischkristallen.) H. Hanemann. *Zeitschrift für Metallkunde,* Vol. 24, July 1932, pages 164-165. Takes issue with article by A. Smekal. Contains reply by Smekal. RFM (5b)

The Deformation of Ternary Magnesium Solid Solution Crystals. (Über die Dehnung ternärer Magnesium-Mischkristalle.) E. Schmid & G. Siebel. *Metallwirtschaft,* Vol. 11, Oct. 21, 1932, pages 577-579. The deformation under tensile stress of single crystals of 2.8% Al, 0.9% Zn, balance Mg and 5.6% Al, 1.0% Zn, balance Mg, was determined. The orientation of the crystals was determined by X-rays and angle between the base and the longitudinal direction varied between about 10° and 61°. The stress-strain curves are shown. These ternary alloys have a distinct initial slip strength of the base plane corresponding to the yield point. The strengthening of these alloys in comparison with pure Mg is equal to the sum of strengthening of the 2 binary alloys of equal alloy content. The stress-strain curves for the ternary alloys are somewhat flatter than for the corresponding binary alloys. The relation between maximum stress, total elongation and Al content of binary Al-Mg alloys is shown graphically. The 2.8% Al ternary alloy does not vary much from the corresponding binary alloy, but higher values are obtained for the 5.6% Al ternary alloy. CEM (5b)

The Tungsten Cobalt System. (Über das System Wolfram-Kobalt.) Curt Agte, Karl Becker & Frhr. v. Göler. *Metallwirtschaft,* Vol. 11, Aug. 12, 1932, pages 447-450. Samples of W-Co alloys were prepared from 99.99% W and 98% Co by pressing the mixed powders and sintering them in H_2 atmosphere, raising the sintering temperature 50° at a time. The temperatures at which the surface melted were used in plotting the solidus curve. The samples were then quenched in water and examined magnetically, microscopically and by X-rays. The solidus curve does not show any point corresponding to a compound. By the other methods it was determined that Co is soluble up to about 10 atomic % in W, producing a considerable drop in melting point but no change in the lattice. W is soluble in Co up to 8 atomic % Between these 2 phases only one other intermediate crystal form exists, which has a variable composition of 50 to 62.5 atomic % Co. With increasing Co content the average lattice constant of this crystal form increases by .4%. On the W side it is non-magnetic, but becomes slightly magnetic with increasing Co content. Between 10 and 50 atomic % Co the alloys consist of a heterogeneous mixture of solid solution of Co in W and the W-Co crystal form. Between 62.5 and 90 atomic % they consist of a mixture of solid solution of W in Co and W-Co crystal form. CEM (5b)

Material Testing and X-Ray Stereo-Cinematography. (Die Materialprüfung und die Roentgen-Stereokinematographie.) G. Koegel. *Angewandte Chemie,* Vol. 45, Jan. 9, 1932, pages 43-44. The possibilities and requirements of stereoscopic projections of the metallic structures on a luminescent screen are discussed and several apparata for this purpose reviewed. Exact measurements can be made by these pictures only with certain precautions. Ha (5b)

On the Regler Calibration Method for Precision Determinations of Space Lattice Dimensions and the Authors' Method. (Über die Reglersche Eichungsmethode zur Präzisionsbestimmung von Gitterdimensionen und die unsrige.) N. H. Kolkmeijer & A. L. Th. Moesveld. *Physikalische Zeitschrift,* Vol. 33, Mar. 15, 1932, pages 265-269. The calibration method for precision determinations of space lattice dimensions of powder photographs, previously published by Regler (*Physikalische Zeitschrift,* Vol. 32, Sept. 1931, pages 680-687) is compared with the authors' calculations independently published at the same time. (*Zeitschrift für Kristallographie,* Vol. 80, Sept. 1931, page 63-90.) Special consideration is paid to the formulae concerning the corrections for the thickness of the sample. The agreement of both methods of calculation is very satisfactory for a certain choice of the anti-cathode focus. EF (5b)

Lattice Parameters of Solid Solutions of Silicon in Copper. H. F. Kaiser & C. S. Barrett. *Physical Review,* Vol. 37, June 1931, page 1697. A brief review of a paper presented before the American Physical Society. WAT (5b)

Radium in Engineering Inspection. V. E. Pullin. *Engineering,* Vol. 153, May 6, 1932, pages 492-494. Compares use of radium and X-rays in the examination of materials. In examining castings and forgings up to 3" of steel, X-rays are more satisfactory than radium because the exposure time is less and finer detail can be seen. Radium can be used to advantage for detecting big cracks, blow-holes and corrosion cavities in large structures. Radium can be used in places where access is impossible by an X-ray tube. Neither method is practical for routine testing. LFM (5b)

The Iron-Mercury System and the Solubility of Nickel in Mercury. (Ueber das System Eisen-Quecksilber und über die Löslichkeit von Nickel in Quecksilber.) Eva Palmäer. *Zeitschrift für Elektrochemie,* Vol. 38, Feb. 1932, pages 70-76. The solubility of Fe in Hg was determined in the case of amalgamated Fe wire, and was found to be about 0.00007% by weight, and to be practically constant between 20° and 211° C. The crystals that were deposited out of the Hg on the electrolytic Fe (the so-called iron-amalgam) were found, when separated, to consist, not of a definite compound of Fe and Hg, but of pure Fe that had been suspended in the Hg. The solubility of Ni in Hg was determined by stirring Hg with Ni wire, and was found to be 0.00014% by weight at 20° C. Ha (5b)

The Crystal Structure of AuCd. A. Ölander. *Zeitschrift für Kristallographie,* Vol. 83, July 1932, pages 145-148. (English) Investigation of the intermediate phase (β phase) in the binary system CdAu around 50 atomic %, gave the following dimensions of the unit cell: a = 3.144 A. U., b = 4.851 A. U., c = 4.745 A. U. The specific weight of the alloy was found to be 14.5, hence there are 4 atoms to the elementary body. The probable space group is V_h^5. The alloy has the same structure as the corresponding phases in the AuZn and CuZn systems when the temperature is above 267° C., whereas below this point the lattice will be "wrinkled" in a very remarkable way. EF (5b)

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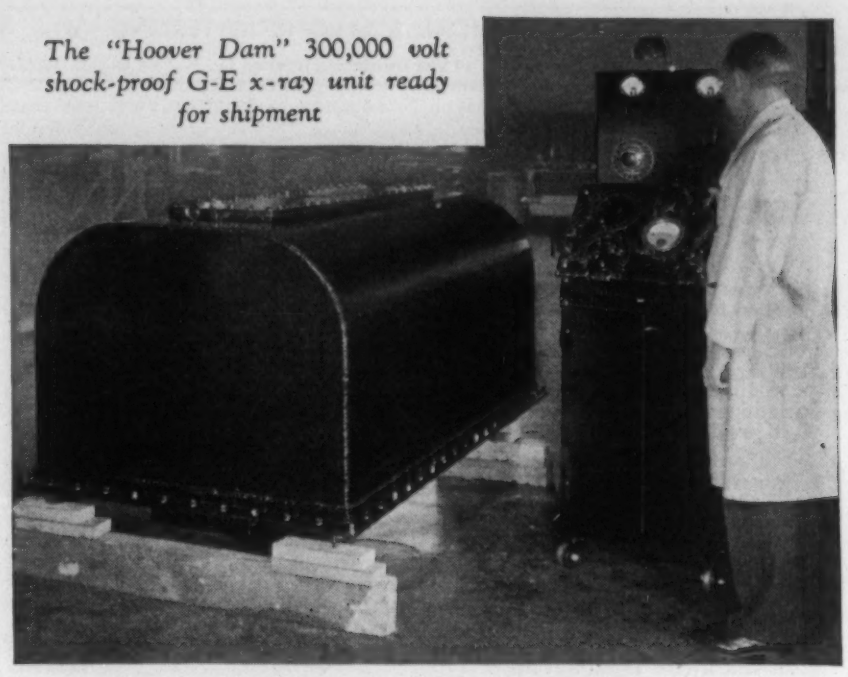

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Notched Bar Testing (Kerbschlagprobe). E. STARCK. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 412-414. Brief résumé of the various bar sizes and notch types. HWG (6)

The Testing of Castings. WALTER ROSENHAIN. *Journal Institute of Metals,* Vol. 48, 1932, pages 273-285; *Engineering,* Vol. 133, Mar. 25, 1932, pages 383-385; *Foundry Trade Journal,* Vol. 46, Mar. 10, 1932, pages 154-156; *Heat Treating & Forging,* Vol. 18, June 1932, pages 362-364; July 1932, pages 420-422. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 322. OWE + LFM + MS (6)

Loading Tests with New Type Welded Beams. (Belastungsversuche mit neuartigen geschweissten Trägern.) RUDOLF ULBRICHT. *Elektroschweissung,* Vol. 3, Jan. 1932, pages 12-13. As contrasted with former welded sheet beams half T-irons are used. This offers the advantage in that the welded seams are located closer to the neutral axis. The new beam proved successful in a number of cases. The results of loading tests are reported. GN (6)

A New Type of Dynamic Balancing Machine. E. L. THEARLE. *Transactions American Society of Mechanical Engineers,* Vol. 54, June 15, 1932, Applied Mechanics, pages 131-141. In this method of determining the planes of correction where balancing weights have to be added or removed, the rotating body to be balanced is suspended rigidly on one end, the other supported by a spring. The theory of the method is developed; the machine employs an automatic compensating device so that even an unskilled operator can obtain accurate readings of amount and position of unbalance. The operation of the machine is described. Ha (6)

Photoelastic Study of Shearing Stresses in Keys and Keyways. A. G. SOLAKIAN & G. B. KARELITZ. *Transactions American Society of Mechanical Engineers,* Vol. 54, June 15, 1932, *Applied Mechanics,* pages 97-123. The technique of photoelastic determination of stresses in structural members using bakelite as the transparent medium is described. The mechanical properties of bakelite and the process of annealing it for the removal of internal stresses are explained. A great number of photographs are reproduced showing that rounding the corners and corresponding chamfering of the key reduces the stresses. Ha (6)

The Notched-bar Impact Test as an Acceptance Test. (L'essai de résilience comme essai de réception.) A. STECCANELLA. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 379-387. The tensile and impact specifications for various grades of steel used by the Italian railways, and the usual range of impact figures given by the material delivered are shown in tables and diagrams. In 16 of these grades the results are based on tests of 1000 to 15000 specimens. Impact tests are regularly made on all steel that is subjected to the tensile test. A Mesnager notch is used. HWG (6)

Elastic and Inelastic Behavior in Spring Materials. M. F. SAYRE. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 99-105. See *Metals & Alloys,* Vol. 2, Aug. 1931, page 143. Ha (6)

Rockwell Testing. (Die Rockwellprüfung mit Verspannung.) GEORG REICHERTER. *Die Werkzeugmaschine,* Vol. 36, Sept. 30, 1932, pages 333-336. After surveying Brinell and Rockwell tests and their relations, advantages and disadvantages of both of the tests are considered, the Rockwell test being distinguished by the possibility of testing the hardest pieces and avoidance of measuring the indentation. Special fixtures are described to avoid displacement of intricate pieces on the testing table during the test. Illustrations show such fixtures for testing tips of tool steels, conical shafts and bevel gears. In using these fixtures a modified Rockwell tester must be applied. GN (6)

Impact Tests—Standard Test Pieces. (Kerbschlagproben—Normenprobe.) M. SCHMIDT. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 365-371. Discussion of the factors of size and shape of specimen. The author prefers the V notch. HWG (6)

Wear of Metals. SAMUEL J. ROSENBERG & HARRY K. HERSCHMAN. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 52-56. The authors analyze different types of wear and describe a number of wear testing machines. Laboratory tests where conditions can be accurately known and quickly made are essential for development of materials. The wide difference in the effect of different types of service on a given material necessitate correlation with service tests which is beset with difficulties. In discussion of the interpretation of wear test results 7 factors due to the metal and 8 due to the service are tabulated. Conditions of service such as a tire chain are discussed where some other factor as resistance to shock must be considered along with a wear test result. Attempts to relate wear resistance with other mechanical properties has been unsatisfactory, though it is generally true that hard materials resist wear better than soft materials there are numerous instances of the reverse. The mechanism of abrasion is discussed and it is shown that wear in a Brinell wear testing machine took place by tearing of particles of the grains away from the surface accompanied by severe local straining. 21 references. WLC (6)

Meaning of the Notched-bar Impact Test for Investigation and for Acceptance Test Purposes. R. H. GREAVES. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 372-378. Discussion of the transition range in a plot of energy absorbed versus temperature of test, as affected by dimensions of the bar, and other factors. A high impact figure does not insure that the material may not show brittle behavior at a slightly lower test temperature. Demanding a good impact figure in a test at the temperature of service tends to eliminate steels of the class in which adventitious failures are likely to occur. In the experience of Woolwich Arsenal, much of the material that has actually failed in service by cracking, gives poor notched-bar tests, and the concordance is too high to be accidental. HWG (6)

The Standardization of the Notch-Impact Test. (Zur Normung des Kerbschlagversuches.) M. MOSER. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Mar. 12, 1932, pages 257-261. The author points to the present impossibility of a comparison of the results of notch-impact tests, as is possible with tensile strength. Not only in different countries, but also in the same country are the tests made in a different manner, and so it is suggested that a standard test be developed which is suitable by the shape of the test piece and kind of notch, to distinguish as correctly as possible between different steels and their properties at room temperature. Additional tests which might be necessary should be restricted to a minimum. Several samples are illustrated which are all of smaller size than the test piece for the Charpy test. Ha (6)

The Notched Bar Impact Test in Germany. (Der Stand der Kerbschlagprobenfrage in Deutschland.) M. MOSER. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 342-355. The impact test has value in classifying materials even though the quantitative figure is not used in design. The shift of the impact curve with temperature and with the aging of an alterable steel is illustrated. The standard German Charpy specimen is 10 mm. square, 55 mm. long (40 mm. between supports, with a round notch 2 mm. (0.078") diameter, 3 mm. (0.118") deep). For very tough materials, a 45° V notch with 0.5 mm. radius at the base, and of the same depth may be used, but the round notch is preferred for general use. Abstracts of, and references to, 33 papers. HWG (6)

Plasticity of Copper-zinc Alloys at Elevated Temperature. ALAN MORRIS. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 336-352. Includes discussion. See *Metals & Alloys,* Vol. 2, June 1931, page 112. (6)

Full-Load Calibration of a 600,000-lb. Testing Machine. H. F. MOORE, J. C. OTHUS & G. N. KROUSE. *Transactions, American Society for Testing Materials,* Vol. 32, Pt. 2, 1932, pages 778-782. The paper describes the calibration of a screw-power, balance-beam testing machine of 600,000-lb. capacity. The calibration was made by the use of two 10,000-lb. standard weights and an elastic bar fitted with a delicate strainometer. The elastic bar was used merely as a transfer instrument, and it was not necessary to evaluate its elastic constants. All that was necessary was to have a strainometer sufficiently sensitive that load on the bar could be reproduced a few moments later with a high degree of accuracy. After 27 years of rather severe service the testing machine was found to still have a high degree of accuracy and sensitivity. VVK (6)

The Determination of the Depth of the Case of Case-Hardened Pieces. (Ueber die Bestimmung der Einsatztiefe bei im Einsatz gehärteten Werkstücken.) WALTER MELLE. *Werkstattstechnik,* Vol. 26, Jan. 15, 1932, pages 21-24. The thickness of the hardened case of a case-hardened piece can be determined by the Rockwell hardness test by measuring the hardness with 2 different weights when making the test. A diagram shows the relation giving depth as ordinate against hardness as abscissa. Ha (6)

Discussion on Impact Testing. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 388-405, 415-420. The representatives of the various countries agreed that it would be fine to have an international standard impact bar, but each one wanted this to have the notch with which his own country's main stock of data had been obtained. The bulk of the evidence was in favor of a V notch on the ground that it is more discriminating than the round notch, but the German and British practice in depth of notch and root radius is so different that neither one is likely to give way. For the less tough materials, the Mesnager type of notch is required, but here again the practice as to radius and depth varies. All the discussion referred to Charpy type of bar which is apparently far more popular at present in all the countries represented than is the Izod. HWG (6)

Testing Sheets for Deep-Drawing Qualities. *Iron & Coal Trades Review,* Vol. 124, May 20, 1932, page 837. From a report by F. Eisenholb, *Stahl und Eisen,* Vol. 52, Apr. 14, 1932. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 322. Ha (6)

The Damping Capacity of Copper, Zinc and Its Alloys at Dynamic Tension-Compression Stresses. (Die Dämpfungsfähigkeit von Kupfer, Zink und ihren Legierungen bei dynamischer Zug-Druck Beanspruchung.) R. GÖTZELT. *Forschung, Zeitschrift Technische Mechanik und Thermodynamik,* Vol. 3, Sept./Oct. 1932, pages 241-246. The experiments were carried on in the apparatus described by Voigt in *Zeitschrift für technische Physik,* Vol. 9, 1928, page 321. For measuring the damping capacity of relatively plastic metals such as Cu and its alloys proper dimensioning of the test bars and special precautions in clamping the bars in the grips of the machine are necessary. For Cu, brass and bronze certain damping ranges were found, i.e. a decrease of initial damping, an increase of damping capacity with increasing load and constant damping capacity at every load stage below the fatigue limit. Above this limit damping did not attain constant values. The constant damping decrements obtained with the initial load were practically always the lowest; they were not altered after a longer interruption of the load. As contrasted with this result the constant curves taken at higher load stages showed a considerably lower course after a 24 hr. rest; a few of the values were even lower than the lowest values obtained with the initial load stage. After short loading, however, the curves returned to the original stable location. The damping values for various brands of commercial brass show but slight differences. The damping of the alloys is appreciably smaller than that of its 2 main components. Damping of high grade alloys shows characteristic deviations from commercial brands. At equal loads special Cu shows a considerably higher damping than commercial Cu. For Zn the damping capacity does not increase in increasing the load. Slight injuries of the bar surface do not affect damping properties. In testing the damping capacity of brass between —120° and + 400° C., a maximum of damping was found at —50° C. and a minimum at + 270° C. 13 references. GN (6)

Testing for Hardness. (Härteprüfung.) B. Buxbaum. *Zeitschrift für Instrumentenkunde,* Vol. 58, Feb. 1932, pages 87-88. The writer critically discusses the conception "hardness" and the commercial hardness testing machines. The greatest reliability is ascribed to the Rockwell Machine, but 6 main sources of error are pointed out and their degree of error is estimated. Due to an additive effect, divergencies of 5 Rockwell units may occur. Then the author deals with his improved testing method based on filing with a tool that incorporates a large hardness scale. EF (6)

The Strength of β′ Brass. (Über die Festigkeitseigenschaften von β′-Messing.) U. Dehlinger & F. Mendl. *Metallwirtschaft,* Vol. 11, July 29, 1932, page 424. The β to β′ transformation in brass, which is accompanied by an increase in elongation and decrease in tensile strength, requires a longer annealing period than is usually used in industry. 2 samples of brass containing 51.8% and 52% Cu were pressed at 600° C. and annealed at 430° C. for 24 hours. No difference in structure could be determined by microscopical examination. Annealing at 600° C. for 1 hour produced recrystallization, but subsequent annealing at 430° C. for 24 hours produced no further change. Results of the tensile tests are given. 4 references. CEM (6)

On the Significance of the Yield Point for Non-ferrous Metals. (Über die Bedeutung der Streckgrenze bei Nicht-Eisen- Metallen.) Bosshardt. *Schweizerische Technische Zeitschrift,* Vol. 29, Aug. 25, 1932, pages 521-523. It is shown that the yield point of non-ferrous metals, defined as the stress at which the permanent elongation amounts to .2% is no satisfactory yardstick for their mechanical properties. After dealing with the relations between yield point and cold working as well as tensile strength and cold working the author points out that the mechanical properties of non-ferrous metals are sufficiently characterized by tensile strength, elongation at fracture and hardness. GN (6)

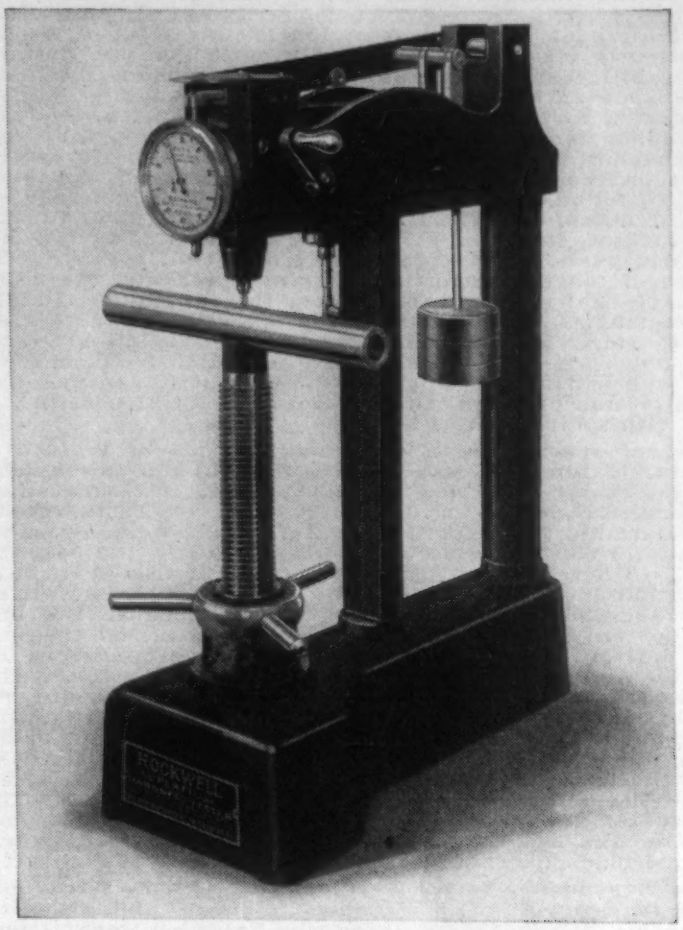
Measurement of Angular Strains During the Twisting of Cylindrical Specimens. C. E. Larard. *Engineering,* Vol. 133, Apr. 8, 1932, pages 417-418. In studying the behavior of ductile material during twisting to destruction, it is necessary to have an accurate instrument to measure the angles of twist corresponding to the increasing twisting moments. 2 such instruments are described (1) a high-precision torsionmeter for measuring very small increments of angular strain through the so-called elastic period and beyond the normal yield point, and (2) a handy laboratory torsionmeter for measuring angles of torsion through both elastic and plastic stages. The former is used for measuring the large plastic or viscous strains up to the maximum torque for destruction; the large instrument is used for moderately large and very large torsion specimens up to and over 3″ diameter and the laboratory instrument for the testing of small and moderate diameter specimens. LFM (6)

Kinematography in Photoelasticity. Max M. Frocht. *Transactions American Society of Mechanical Engineers,* Vol. 54, June 15, 1932, Applied Mechanics, pages 83-96. One of several methods of stress analysis in metals is photoelasticity. The author describes an arrangement which used cinematographic pictures of stress distribution taken in monochromatic light. A great number of the moving pictures are reproduced. They show a variety of stress-distribution patterns and their formations. Stress concentration can spring from various sources such as holes, notches, grooves, scratches, etc. A layer of rubber, Pb or wood has been found to eliminate stress concentration due to a die. When sources are many and close they can become mutually destructive. Applications for practical purposes are illustrated. Ha (6)

Special Methods of Testing Aircraft Materials. David M. Warner. *Transactions American Society of Mechanical Engineers,* Vol. 4, July-Sept. 1932, Aeronautical Engineering, pages 141-149. The testing of welded and riveted joints, axles, wheels and brakes, struts, beams, etc., as applied at the Wright Field for airplanes is described in detail. It is recommended to make the tests on aircraft engine materials above the temperature ranges to which they are subject in service. Service conditions should be simulated as nearly as possible. Testing apparatus is described and charts reproduced. Ha (6)

Permeability of Sheet Steel. G. Waters. *Electrical Review,* Vol. 110, Apr. 29, 1932, page 628. Describes method of testing and includes curves showing results of tests on 4 different makes of steel. Analyses of the specimens are not given. MS (6)

Plastic Flow at the Compression Test. (Das Fliessen beim Druckversuch.) Hans Waschek. Dr. Ing. Thesis, Technische Hochsche, Breslau, 1932, 94 pages. The paper first discusses the literature on the subject with special reference to plastic flow in a most comprehensive manner. Tests were undertaken to simplify and facilitate the method for measuring the crystal deformation as previously described by Tafel & Scholz. (See *Metals & Alloys,* Vol. 1, July 1930, page 639). Cylindrical samples of .05 C steel (Krupp WW), 28 mm. high, 24 mm. diam., tensile strength 29 kg./mm.^{2}, elongation 38.7%, reduction of area 79.6%, were normalized for 1 hr. at 900° C. and 930° respectively and then upset in a 500 ton press with a maximum velocity of 170 kg./sec. = .35 kg./mm.^{2}. Samples were upset by 20%, 35%, 50%, and 70%. The control measuring method for plastic deformation which was combined with the calculation in the above mentioned paper was separated from it and modified so that it can be used independent of the calculation. The previous equations on calculating the course of plastic deformation were also modified for compressive tests. 2 numerical examples illustrate the calculation. With the aid of this modified method the crystal deformation was investigated for the stress distribution. The grain sizes were measured in various cross-sections of all upsetting stages. On the basis of the results various hypotheses on plastic flow are considered; that by Tafel was substantially verified. In compressive tests plastic deformation is a deformation of crystals as well as a displacement in regard to their mutual location, as in the case of tensile tests. These fundamental occurrences were also observed in the compressive test, the results, however were not sufficient to evaluate them quantitatively. 48 references. GN (6)



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On the Effect of Notches on the Strength of Structural Parts. (Ueber den Einfluss von Kerben auf die Festigkeit von Konstruktionsteilen.) EUGEN ARMBRUSTER. *Zeitschrift des bayerischen Revisionsvereins,* Vol. 36, Sept. 30, 1932, pages 199-205. Calculation of the stress distribution on notches is not yet sufficiently cleared up to be of practical value. Suitability, applicability and disadvantages of the various methods for stress measurement (extension measurements with fine measuring instruments, photo-elastic method, measurements on rubber model bodies) are discussed. Important factors for the notch effect at dynamic stresses and its numerical effect on the fatigue limit are considered as, for instance, form of notch, method of processing notches, surface condition of notch, etc. The following rules are given for avoiding fatigue failures. (1) Precise machining of all highly strained parts, (2) avoidance of subsequent injuries, (3) increase of tensile strength by surface pressing, (4) avoiding of sharp changes in cross-section, (5) rounding of edges by chamfering, and subsequent pressing of the chamfer in order to work harden the highly stressed points, (6) cross bore holes for lubrication are to be rounded off on the surface, subsequent pressing of the edges is advantageous, (7) the direction of lubricating grooves should, if possible, coincide with a direction of principal stress. GN (6)

Impact-Tensile Tests with Sample Rods of Welded Steel Sheets. (Schlagzugversuche mit Stäben aus geschweissten Stahlblechen.) *Zwanglose Mitteilungen des Fachausschusses für Schweisstechnik,* No. 20, Mar. 1932, pages 4-7. Tests were made to determine whether the material in welded seams is stronger or less capable of deformation than the parent material, to determine if the fracture is brittle or if the deformation energy is absorbed by the material as well as by the weld. The impact test was chosen because the impact acts not only, as in the impact-bending test, on the welded seam but on the entire welded joint. The preparation of the samples and the results are described. It was found that a brittle fracture under the given conditions does not occur; on the contrary, the weld which has less strength than the sheet but a greater deformability is inferior in its behavior under impact stress. A good weld should, therefore, have at least the same strength as the parent material in order to utilize the deformability of the sheet as much as possible; the weld must possess a certain capacity for deformation. Whether the same conditions hold good for oscillating endurance loads has not yet been ascertained. Ha (6)

The Dependence of the Permeability of Iron Wires on the Field in Case of High Frequency. (Die Abhängigkeit der Permeabilität von Eisendrähten vom Felde bei Hochfrequenz.) M. WIEN. *Physikalische Zeitschrift,* Vol. 33, Feb. 15, 1932, pages 173-175. Tests were made on 0.5 mm. Fe wires at low frequencies and at high frequencies of 31, 96, 700 and 3400 m. wave length. An increase of wave length with cycles was noticed at all high frequency wave lengths. According to Ewing's conception the results can be interpreted as follows: the initial permeability corresponds to the completely elastic movements of the elementary magnets. Then the permeability becomes dependent on the frequency and a phase loss occurs after the elementary magnets pass the elasticity limit and friction occurs. This part is more extended in the high frequency field. EF (6)

Contribution on the Critical Valuation of the Bending Test on Welded Samples. (Beitrag zur kritischen Wertung des Biegeversuchs an geschweissten Proben.) K. JURCZYK. *Elektroschweissung,* Vol. 3, Aug. 1932, pages 154-155. Angle of bending is not the proper measure for the elasticity of welded joints. The effect of plate thickness, curvature diameter and distance of bending rolls on the results of bending tests are discussed. A new bending device is described which avoids the faults of former constructions. GN (6)

Tests on Cast Iron—a Consideration of Test Results Obtained in Czechoslovakia. M. F. PISEK. *International Association for Testing Materials, Zurich Meeting,* 1931, Vol. 1, 1932, pages 56-74. (In English.) Recounts cooperative work of the Czechoslovakian Standards Association comparing tensile, transverse, hardness and shear tests on 22 classes of iron. Frequency curves are shown. Tensile specimens of the American standard form were prone to fracture away from the test section. A gradual taper with only a short cylindrical section is preferred by the author. The shear test was found to show the smallest divergence from proportionality to tensile tests, being more uniform than transverse tests. HWG (6)

The Strength of Thin Plates in Compression. TH. VON KARMAN, E. E. SECHLER & L. H. DONNELL. *Transactions American Society of Mechanical Engineers,* Vol. 54, Jan. 30, 1932, Applied Mechanics, pages 53-57. In aeronautical structures, thin metal sheets are often used beyond the stability limits and the load which can be carried by the structure is determined by the ultimate strength in compression. Recent experiments by the Bureau of Standards have shown the ultimate load to be independent of width and length of the plate and approximately proportional to the square of the thickness. The theoretical analysis shows the ultimate strength of a plate to be proportional to the square roots of the modulus of elasticity and the yield point of the material and to the square of the thickness. Tests agree well with the theory. Ha (6)

Experimental Researches on the Barkhausen Effect. (Recherches expérimentals sur le phénomène de Barkhausen.) ST. PROCOPIO. *Revue Générale de l' Electricité,* Vol. 31, Feb. 13, 1932, pages 211-213. Abstract from *Annales scientifiques de l' Université de Jassy,* Vol. 16, Mar. 1931, pages 352-374. Study of influence of intensity of magnetizing of the substance considered and of passage of alternating-current through the substance. Concludes that Barkhausen effect is due to the orientation of the elementary particles and that it is proportional to the variation intensity of magnetization. Passage of an axial alternating-current increases it, this increase depending upon the values of the alternating-current and of the constant magnetic field for which Barkhausen effect is being investigated. Influence of alternating-current on the phenomenon is due to increases in magnetization of the Fe. MS (6)

Fatigue of Metals (6f)

Surface Stresses and Fatigue Fracture of Anti-Friction Bearings. (Oberflächenspannungen und Ermüdungsbruch bei Wälzlagern.) R. MUNDT. *Forschung auf dem Gebiete des Ingenieurwesens,* Vol. 3, May/June 1932, pages 127-134.

The results of running tests on 3 ball bearings are compared with theoretical considerations of Hertz on the conditions of stress at the contact of curved surfaces. It is shown that the influence of surface deformation on the carrying capacity of a bearing is quite different from the expectations based on the calculation of the normal stresses. Similar considerations on roller bearings prove that such bearings are much better fit to take up intermittent loads than ball bearings. Tests on roller bearings show that the tangential stresses are not only constant for various-sized bearings but that, for equal duration, the stresses correspond to those of ball bearings. 15 references. GN (6f)

METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Standardization of Chemical Methods of Testing Metallic Coatings. N. A. ISGARISHEV & N. P. EGOROVA. *Tzvetnuie Metallui,* No. 6, June 1931, pages 713-719.

The authors studied the relative merits of various chemical methods for determination of thickness and uniformity of Zn coatings. They recommend the method of Bauer (H_2SO_4 and As_2O_3) for the determination of thickness, and the method of Werulund (acetic acid and H_2O_2) for detection of holes in the Zn coatings. The cupric sulphate method is considered incorrect and is not recommended. BND (8)

The Cathode Sputtering of Beryllium and Aluminum in Helium. P. D. KUECK & A. KEITH BREWER. *Review of Scientific Instruments,* Vol. 3, Aug. 1932, pages 427-429.

For the production of the He spectrum, Be proved to be a more suitable cathode material than Al; the arc burns much more quietly, the number of atoms sputtered is 1.5 times greater than for Al. Also the light transmission is far greater for Be. The higher melting point of Be is another factor in its favor (1350° against 658° C.) Ha (8)

Spraying Molten Metal to Combat Corrosion. *Petroleum Engineer,* Vol. 3, Aug. 1932, pages 38-40.

One of the methods now used with success to prevent or reduce the corrosion of refinery equipment consists in spraying molten metal onto the metal surface to be protected. The atomized metal is driven into the pores of the surface receiving it, cools instantly, and becomes a part of it. The surface must first have been cleaned and roughened by sand-blasting. Several coats may be applied if desired, or an under-coating of Zn may be laid on first. Al coating on exhaust ells of gas compressors that had been on trial for 10 weeks appeared to be perfectly tight at the end of that time. EF (8)

The Electric Oxidation of Aluminum with Polarized Alternating Currents up to high Frequencies. (Die elektrische Oxydation des Aluminiums mit polarisierten Wechselströmen bis zu hohen Frequenzen.) F. WOLHR. *Aluminium, Hauszeitschrift V. A. W. und Erftwerk,* Vol. 4, Apr.-June 1932, pages 94-98.

A polarized high-frequency current is a current on which a direct current of such value is superimposed that the resulting current has a wave form on one side of the zero-axis only with the zero value on this axis. The effects on and the properties of oxide films produced with such currents were investigated and compared with direct current which was interrupted mechanically and by a Wehnelt interrupter. It was found that the breakdown voltage of the oxide film depends to a great extent on the frequency of the polarized current; it increases from 50 cycles to a maximum at 1000 cycles and then decreases rapidly; the best value was 6000 V for all frequencies but the scattering of the values was much greater than at 1000 cycles. The maximum at 1000 cycles is explained by the anodic gas charge of the base metal and the diffusing of the electrolyte which, at this frequency, seems to go on easiest. Ha (8)

The Electric Oxidation of Aluminum. (Die elektrische Oxydation des Aluminiums.) HANS SCHMITT. *Aluminium, Hauszeitschrift V. A. W. und Erftwerk,* Vol. 4, Apr.-June, 1932, pages 79-94.

The oxide film formed on Al acts as a valve for alternating current and has also a corrosion protective and electrically insulating effect. According to the use the oxide film was formed with the particular purpose in view. A new method was developed by the V.A.W. Lautawerk, Berlin, which produces on Al and Al alloys oxide films which show the protective action in a considerably more pronounced degree as the crystalline structure of the oxide film can be varied so that the range of application is greatly enlarged. The method of producing the oxide films in baths or solutions of definite composition is treated in detail, the properties of the film vary according to whether alternating or direct current was used for the oxidation. The treatment is different for Al parts which are not bent in service, such as plates, sheets, and those which are subject to bending, such as wire, strips, etc. The oxide film consists normally of a pure γ Al oxide which is crystalline but has an extraordinarily fine grain. By a certain treatment this γ oxide can be converted into Al hydroxide (poor in water) and the fineness of the grain can be influenced. The bath consists of a solution of 3-10% oxalic acid with additions of up to 0.1% chromic acid into which the objects are immersed at 15-30° C.; the current density should be 60-300 amp./dm.^{2} at 60-100 volts; both alternating or direct current, or also high-frequency rectified alternating current can be employed. The hardness of this oxide film is very great, and the dielectric strength excellent; the breakdown voltage for a film of about 0.05-0.1 mm. is 2500 volts at ordinary air pressure, decreasing only slightly to about 2200 volts at 100 kg./cm.^{2} pressure. Layers up to 0.8 mm. can be produced but usually 0.05 to 0.1 suffice for practical purposes; temperatures of more than 200° C. damage the films. The melting point of the film is very high; the thermal utilization is therefore limited by the Al itself. Many practical applications, such as insulated wires in transformers for 5000 volts, for refining the surface of castings, etc. are described, and the mechanical properties, hardness, suitability for bending, corrosion-resistance, coloring of surface, etc. are illustrated. 23 references. Ha (8)

HEAT TREATMENT (10)

The Heat Treatment and Manufacture of Small Automotive Steel Parts. ERNEST F. DAVIS. *Fuels & Furnaces,* Vol. 9, Dec. 1931, pages 1345-1350. Bolts, screws and studs for automobile construction require about 500,000 tons of steel annually of 3 general types, alloy steels for highly stressed parts, medium C (0.30-0.50 C) to stand medium stresses, and low C open hearth or Bessemer steels for parts of less vital importance. Carburizing to a depth of .010" to .060" is applied to parts subject to wear. The S. A. E. class numbers of the steels most widely used are given, together with the heat treatments and brief descriptions of some automatically controlled apparatus for hardening and drawing. CMB (10)

Testing of a Material for Regeneration of Steel. (Prövning av ett medel för regenerering av stal.) CARL BENEDICKS. *Jernkontorets Annaler,* Vol. 116, July 1932, pages 339-343. A trade compound "ferronovo" was found no more useful than ordinary oil in regenerating overheated steel. HCD (10)

Boeing Airplane Company. J. B. NEALEY. *Heat Treating & Forging,* Vol. 18, July 1932, pages 433-434; *Iron Age,* Vol. 129, Mar. 10, 1932, pages 606-607, 628. Deals particularly with method and equipment for heat treating Al and its alloys. Immersion type of equipment used. Heating medium is a 50-50 solution of KNO_3 and $NaNO_3$ kept at 940°-950° F. Parts are quenched in cold H_2O and washed in hot H_2O. Time of immersion depends upon thickness of parts. Aging of duralumin rivets after treatment until they can be used is temporarily suspended by placing them in a refrigerator cooled by dry ice. Steels of S.A.E. 2330 and 4130 analysis are also treated. MS + VSP (10)

Where Small Tools are Heat-Treated. *American Machinist,* Vol. 76, Apr. 28, 1932, pages 558-559. Heat treating furnaces, quenching baths and pickling methods applied for small tools by the Union Twist Drill Co., Mass., are described. Ha (10)

Heat Treatment of Wheels or Rims in Electric Furnaces. (Vergüten von Radreifen in Elektrischen Oefen.) R. MICULESCU. *Stahl und Eisen,* Vol. 52, July 21, 1932, pages 710-711. In the past 10 years there have been steady increases in railroad locomotive and car weights as well as in running speeds. These have placed greater demands on the wheels and rims. The Roumanian railroads specified material having a minimum tensile strength of 90 kg./mm.^{2} with 8% elongation. The impact test consisted of 3 blows with a 1000 kg. hammer from a height of 10 m. The steel produced in the past could not meet these higher requirements. Cr and Ni steels were prohibitive due to their cost. Basic open-hearth steel, composed of 0.5 to 0.6% C, 0.35% Si, 1 to 0.8% Mn, 0.07% P and S, was used in the investigation. In order to produce a wheel or rim to meet these rigid specifications, heat treatment studies were undertaken. A generator gas-fired furnace was not quite successful for heat treating. Electrical annealing furnaces were successful and for the production required 6 annealing furnaces were employed, 5 small ones and 1 large one. The construction of these furnaces is given. The 5 small furnaces handle 200 small wheels, total weight 58 tons, per 24 hrs., consuming 270 kw-hrs./ton. The large furnace handles 28 large locomotive wheels, total weight 14 tons, per 24 hrs., using 350 kw-hrs./ton. DTR (10)

Obtaining Better Results in Hardening High-Speed Steel. WILLIAM E. SNOW. *Machinery,* Vol. 38, Mar. 1932, pages 486-488; April 1932, pages 590-592. 3 methods of heating for hardening are: the open forge, gas furnace, the electric furnace. The open forge is generally unsatisfactory. Gas furnaces should be no larger than necessary as the larger the furnace the greater chance for cold spots, which must be guarded against. The electric furnace gives more uniform and constant heat than gas and does not have air introduced to the furnace while heating so the steel is not decarburized and is relatively clean. Martensitic structure is desirable in tool steel. This is obtained by very rapid cooling from a temperature above the critical point. Best equipment for hardening consists of a preheating furnace capable of maintaining a temperature of 1800° F.; a hardening furnace of temperature ranges between 2400° and 2450° F.; a tempering furnace to operate between 850° and 1300° F., all furnaces to be pyrometer equipped. A quenching tank of water cooled oil is required. Steel should be quenched from a rising temperature, never allowed to soak at quenching temperature. Steel should be brought to the hardening temperature as rapidly as possible. Working should be done while hot. Heavy hammering while hot increases the density of the steel. Steel for forging should not be heated too abruptly. Single pieces should be taken from the preheating furnace and inserted in the hardening furnace. The piece is to be watched closely. The appearance of the flux on the metal shows the proper quenching time. The "perfect quench" would be instantaneous. This is impossible. Cold water is probably the fastest quenching medium but is too severe, so oil is used as it does not cause cracking as water does. It is important that oil be kept cool. Complete immersion is necessary. In tempering regular high-speed steels the furnace temperature should be kept between 1000° to 1100° F. Steels containing Co should be tempered to 1200° to 1300° F. These temperatures are for heavy duty tools as lathes and planers. Lighter tools do not require such high temperatures. Avoid high temperatures in grinding the tools. If rehardening is necessary the tool should be annealed first. Cyanide may be used for special hardening. Boracic acid gives freedom from decarburization. RHP (10)

Hardening (10a)

Surface Hardening of Metals by Means of the Oxy-Acetylene Torch. (Die Oberflächenhärtung mittels der Azetylen-Sauerstoffflamme.) *Zeitschrift für Schweisstechnik,* Vol. 22, Sept. 1931, pages 208-211. Reports on a lecture of A. E. Shorter before the British Institute of Welding Engineers. The hardness at the surface of C steel (0.25-0.75%), Ni-Cr steels and cast iron used for gears, axles, spindles, brake drums, etc., is raised from 180 Brinell to 500-600 Brinell. Instead of rapid water quenching, air, oil or nitrogen are accordingly applied. Automatic operation instead of manual performance is indispensable. See also "Metal Surface Hardening," *Metals & Alloys,* Vol. 2, May 1931, page 103. EF (10a)

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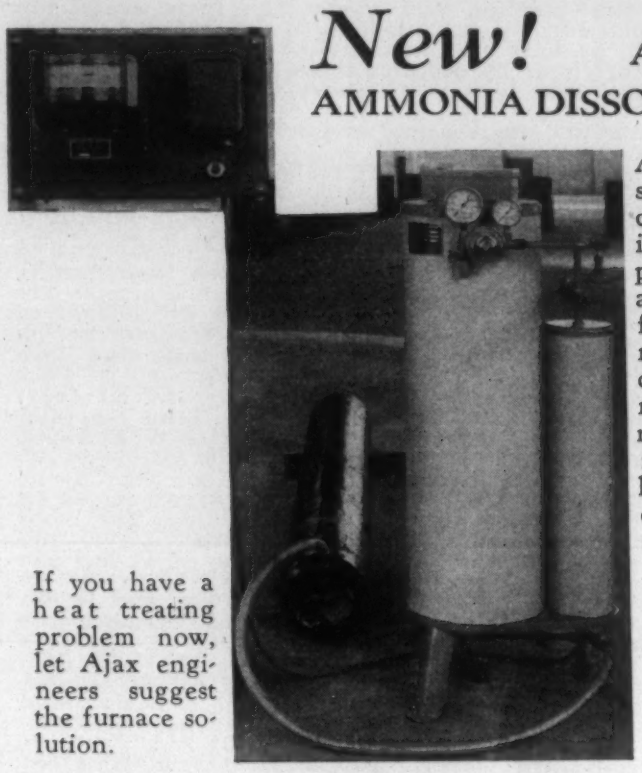

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The "Secret" of Copper Hardening. (Das "Geheimnis" der Kupferhärtung.) RALPH J. SNELLING. *Apparatebau,* Vol. 44, Sept. 16, 1932, pages 127-128. The author deals with the centuries old "secret" of Cu hardening and considers the increase of hardness of Cu owing to (1) oxygen, (2) addition of foreign elements, (3) cold working. Probably all 3 of the methods were known to old copper-smiths and priests. The value of hardness increase of Cu is discussed. GN (10a)

Annealing (10b)

Bright Annealing Furnace Economies. H. HINES. *Metals & Alloys,* Vol. 3, May 1932, pages 113-115. The author describes the economies effected in the handling incident to annealing of mesh bag frames using a conveyor belt type of electric annealing furnace. The furnace atmosphere is controlled to produce a bright annealed article eliminating pickling, drying and handling. The saving in press costs due to better product was sufficient to pay the cost of operating the new furnace so that 100% of the old cost of annealing was saved. WLC (10b)

Theory and Practice of Annealing Steel. (Theorie und Praxis des Stahlglühens.) R. ESCHELBACH. *Werkstattstechnik,* Vol. 26, June 15, 1932, pages 235-240. Descriptive. RFV (10b)

Bright Annealing in the Light of Patents. (Das Blankglühen im Lichte der Patentschriften.) E. FAHRLAENDER. *Deutsche Goldschmiede-Zeitung,* Vol. 35, Sept. 10, 1932, pages 370-371. The paper first deals with the application of various protective gases for bright annealing, as H, N, producer gas, CO_2, O- free air and special gases. Vacuum annealing is then considered. New constructions of bright annealing furnaces, pot annealing as well as electric furnaces, are dealt with. The paper concludes with bright annealing in salt baths. According to recent patents salts free from cyanides are suggested which proved successful. Further improvement of all of the methods as regards refinement and simplicification of the equipment seems advisable. GN (10b)

Case Hardening & Nitrogen Hardening (10c)

Nitriding for Small Production Obtained at Low Expense. R. R. LAPELLE. *Automotive Industries,* Vol. 66, Mar. 1932, pages 390-391; *Iron Age,* Vol. 129, Apr. 14, 1932, pages 874-875, adv. page 18. A new type of nitriding furnace as installed at the Detroit Commercial Steel Treating Plant is described. This installation marks a long advanced step in the development of nitriding equipment. It is of the type which might be termed semi-continuous in principle because, even on limited production, it secured many of the advantages with respect to cost which may be obtained in continuous equipment. Briefly the furnace consists of a movable furnace chamber mounted upon track wheels and located above a stationary hearth. The latter, which is twice the length of the furnace proper, has mounted upon it 2 nitriding retorts, over either one of which the furnace proper may be placed at the will of the operator. Advantages of the stationary hearth used together with the movable furnace are summarized. VSP + DTR (10c)

New Methods of Hardening Steel. (Neue Wege der Stahlhärtung.) OTTO GASSNER. *Metallwirtschaft,* Vol. 11, Aug. 19, 1932, pages 464-465. The case-carburizing method for hardening steel has the disadvantages of requiring a long time, due to the time necessary to heat the boxes and carburizing material, uneven heating of the parts resulting in distortion, and high cost. A separate hardening operation is usually required. These disadvantages can be overcome by the use of salt baths consisting principally of cyanides. They result in heat and time saving, and parts free from scale, but require a special furnace installation. In the Durapid process steel parts can be hardened in ordinary furnaces in from a few minutes to 1 hour by dipping them in a paste and heating them in the open furnace to above the upper point and quenching in the usual way. An even case is produced with minimum distortion, no scaling and at a great saving of time and heat. CEM (10c)

Mechanical Surface Treatment. (Mechanische Oberflächenbehandlung.) LANG. *Zeitschrift für Schweisstechnik,* Vol. 21, June 1931, pages 135-136. Attention is called to the nitriding process and to the hardening method developed by the Edelstahlwerke consisting in a heating of the Cr, Mo and Si bearing steels by means of an acetylene torch immediately followed by a rapid quenching. The depth of the case depends on the revolving speed and the C and Cr content of the steel. The hardening effect is based on a transformation of sorbite into austenite and martensite. The following data are given: initial cost of the acetylene equipment = 8,000 R.M. and 14,000 R.M. construction expenses. EF (10c)

Hardening of Alloyed Steels by Nitrogen. (Die Härtung Legierter Stähle durch Stickstoff.) OSKAR MEYER & W. EILENDER. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Mar. 26, 1932, pages 317-320. A few recent investigations at the Technische Hochschule at Aachen are reviewed which were carried on to elucidate the behavior of Fe during nitriding. The most important alloying elements of a nitriding steel are Al and Cr as they readily form nitrides. This is true of V, Mo and Ti to a lesser degree. The migration of the N into the Fe goes on according to the diffusion law of Fick, and is determined by the migration of the N atoms through the intermediary lattices. The nitride forming capacity decreases with the addition of metals in the order Al, Ti, V, Cr, Mo; the nitrided steels with these additions are all of similar character. The relations between velocity of diffusion and temperature applied are discussed. The application of high-frequency alternating current seems to result in a shortening of time for the process. 22 references. Ha (10c)

The Heat of Formation of Nitrides. III. The Heats of Solution of Some Metals and Metal Nitrides in Acids. (Ueber die Bildungswärmen der Nitride. III. Die Lösungswärmen einiger Metalle und Metallnitride in Säuren.) B. NEUMANN, C. KROEGER & H. KUNZ. **IV. Uranium, Thorium and Lanthanum Nitride. (IV. Uranium-, Thor- und Lanthannitride.)** B. NEUMANN, C. KROEGER & H. HAEBLER. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 207, Aug. 9, 1932, pages 133-144, 145-149. The methods are described and the heats of solution and nitride formation tabulated for Mn, Cr, Mg, Ce, La, U and Th. Ha(10c)

JOINING OF METALS & ALLOYS (11)
Welding & Cutting (11c)

Welding in the Steel Plant. E. L. QUINN. *Blast Furnace & Steel Plant,* Vol. 20, Apr. 1932, pages 346-358; May 1932, pages 425-427.

Except for omission of sections on welding of non-ferrous metals and surface hardening alloys, this article is the same as that in *Journal American Welding Society,* Vol. 10, June 1931, pages 6-10. MS (11c)

Reduced Cost of Bridge Maintenance. FRANK P. MCKIBBEN & WALTER ROOF. *Welding Engineer,* Vol. 17, May 1932, pages 23-28.

The causes for alterations and repairs of bridges when they wear out or when loads increase, that is, corrosion, cracks due to overloading or to defective metal, or excessive stresses, are discussed and several examples described where it was possible by welding to carry out their alterations much more economically than could have been done by riveting. Details of the construction and welding methods are described and the importance of employing only capable welders pointed out. Ha (11c)

Application of Electric Welding in Crane Construction. (Anwendung der Elektroschweissung im Hebezeugbau.) A. MARSCHALL. *Elektroschweissung,* Vol. 3, Aug. 1932, pages 149-150.

Discusses the advantages of electric welding in crane construction. The specifications for welding are tabulated. GN (11c)

On the Theory of Welded Joints. (Ein Beitrag zur Theorie geschweisster Verbindungen.) E. MELAN. *Ingenieurarchiv,* Vol. 3, May 1932, pages 123-129.

The development of the theory of welded joints lags behind the practical application of welding. With the exception of a few investigations of one-dimensional problems (P. Fillunger: Über die Festigkeit von Löt- Leim- und Nietverbindungen, Oesterreichische Wochenschrift für den öffentlichen Baudienst, 1919) there is lacking up to the present time the theoretical treatment of even the simplest 2-dimensional problems as they are represented, for instance by joining a bar to a plate. There are to be found in the literature only a few most unsatisfactory solutions of this problem which are based on the theory of elasticity. The author gives the first fundamental mathematical solution of the theory of welded joints between a plate and a round bar. In his considerations the supposition is made that the weld seam possesses the same elastic properties as the base metal. This only holds approximately, but it is correct as far as the modulus of elasticity is concerned, which is of prime consideration. GN (11c)

Progress in Automatic Hydrogen Welding. SAMUEL MARTIN, JR. *Iron Age,* Vol. 129, Mar. 3, 1932, pages 537-540.

In this method of welding an electric arc is established and maintained between 2 tungsten electrodes. Molecular H is fed into the arc. Atomic H welding affords a temperature of 4000° C. This method does not displace other methods but broadens the field of electric welding. Smooth and strong welds are produced. Considers some of the applications of this process in industry. VSP (11c)

Economy of Progressive and Retrogressive Welding in Built-Up Welds. (Wirtschaftlichkeit der Vorwärts- und Rückwärtsschweissung bei Auftragschweissungen.) BARDTKE & MATTING. *Autogene Metallbearbeitung,* Vol. 25, June 15, 1932, pages 184-187.

Tests were made with respect to gas consumption, time for preheating, welding, after-heating and hammering and the costs for the individual steps and the total welding were determined. It can be stated that the most favorable values were obtained for retrogressive welding without hammering. The expenses for preheating vary greatly according to the kind and size of the object. Retrogressive welding requires a shorter welding time and is a continuous process, while progressive welding can be carried out only with interruptions as the flame heats a small space before the seam which is built up and then the flame passes on to the next step. The economical advantages of the retrogressive welding method can be enhanced further if the piece can be preheated. Ha (11c)

Fabrication of Large Dairy Tanks Demands Expert Technique. L. E. BROWNE. *Steel,* Vol. 90, Feb. 15, 1932, pages 23-25.

A description of the 1000 to 5000 gal. capacity glass-lined tanks made of seamless welded Cr-Ni steel by the Pfaudler Co. for the ice cream and dairy industries. Includes 7 large photographs. JN (11c)

Electric Welding in Merchant Ship Building with Special Reference to the Specifications of the German Lloyd. (Elektrische Schweissung im Handelsschiffbau unter besonderer Berücksichtigung der Vorschriften des Germanischen Lloyds.) BURKHARDT. *Elektroschweissung,* Vol. 3, June 1932, pages 108-112.

After a survey of American and English specifications, those of the German Lloyd from 1931 are discussed. The new German specifications contain fewer restrictions than the American and English ones. Illustrations of all-welded ships are shown. GN (11c)

Welding of Highly Alloyed Tool Steels. (Schweissen hochlegierter Werkzeugstahle.) H. CEGIELSKI & J. GOLENIEWICZ. *AEC—Mitteilungen,* May 1932, pages 184-185.

Millers of 22% W and 5% Cr steels could be satisfactorily welded and repaired by the "Arcatom" welding method; the fine-grained structure of the material was only little changed at the welded place and the hardness differed only inappreciably. Ha (11c)

The Economies of Quality Welding. R. E. KINKEAD. *Welding Engineer,* Vol. 17, Jan. 1932, pages 43-44.

The author defines "quality welding" as a weld which is good enough for the purpose for which it is to be used. To do this it is necessary to have an exact knowledge of the service requirements, and of the stresses in the weld under service conditions, and to be able to judge the life of the weld under any conditions. If these points are taken into account it is maintained great savings can be obtained as no excessive and superfluous care for the case in question is given to the weld. Ha (11c)

The Occurrences in the Welding Arc and Its Effect on the Welds Made with Bare and Coated Electrodes. (Die Vorgänge im Schweisslichtbogen und ihre Einfluss auf die Schweissungen bei blanken und umhüllten Elektroden.) W. STRELOW. *Elektroschweissung,* Vol. 3, May 1932, pages 81-87.

The article first discusses the physical occurrences in the electric arc, with special reference to the emission of electrons and the deflection of the arc in the magnetic field as it is formed during welding near the elements of current which pass through the piece to be welded. Then follows a discussion of the formation of the fused weld by bare and coated electrodes. With bare electrodes it is to be expected that the arc is uniformly distributed over the area of the electrode. With coated electrodes the arc is restricted to the circumference of the coated shell for a long time. For both of the electrodes the course of voltage was studied by taking oscillograms. The drops of the weld metal are much larger with coated electrodes than with bare ones. Coated electrodes offer the following advantage: The base metal adjacent to the weld seam is heated to a larger extent so that the seam does not cool so rapidly. The impurities of the fused metal thus have a better chance to separate. To this fact in particular, next to the favorable type of the formation of the weld drops, the greater purity of weld seams made with coated electrodes is to be attributed. GN (11c)

Economy in Welding Operations. E. LUNN. *Welding Engineer,* Vol. 17, Feb. 1932, pages 45-46.

The principal factors for economical welding are considered to be control of design, materials, welding wire, personnel, welding procedure and the inspection program. To neglect one of these may result in losses in raw material, labor, overhead, good will of the customer and trade reputation. Ha (11c)

Sheet Welding in Production. EARL KELSEY. *Welding Engineer,* Vol. 17, Apr. 1932, pages 42-43; *Welding News,* Vol. 3, Apr.-June 1932, pages 24-25.

Oxy-acetylene welding is the most satisfactory welding method for sheet metal utensils for holding liquids and which have therefore to be tight and are to be porcelain enameled. Butt joints and flanged joints are used preferably, the latter especially for sheet thinner than No. 20 gage. The proper design and application of jigs is explained and the welding technique described. Ha (11c)

Control of Warping in Preheating for Welding. JAS. M. VOSSLER. *Modern Machine Shop,* Vol. 4, May 1932, pages 7-9, 14.

The author gives directions to avoid sagging or other deformations by building supports for castings when hot. Ha (11c)

Effect of Annealing on the Physical Properties of Welds. THOMAS K. VINCENT. *Welding,* Vol. 3, Aug. 1932, pages 463-465.

Tensile, Charpy impact and fatigue tests of welds in C steel and 3.5% Ni steel plates show that annealing at 600° C. reduces all of the physical properties slightly. Advantages are gained in machinability and freedom from internal strains. The Charpy test is considered to be the most valuable. TEJ (11c)

Repairing Worn Shafts. (Herrichten abgenutzter Wellen.) A. O. Scholl. *Maschinenbau,* Vol. 11, Feb. 18, 1932, page 78.

2 axles of a heavy bending machine were worn out and had to be repaired without delaying production more than 3 days. It would have taken a full week to make and mount new axles. While the axles were revolving slowly they were electrically arc welded so that uneven heating was avoided. Thickness of the welded layer was about 1/5". New threads had to be cut. It took 7 hours to repair one. RFV (11c)

Welding Plate Beam Bridge. (Geschweisste Blechträger-Strassenbrücke.) H. Schütte. *Stahlbau,* Supplement to *Bautechnik,* Vol. 5, June 10, 1932, pages 89-91.

Calculation, design, welding and mounting of a road bridge. The bridge was electrically welded with coated electrodes. 4 references. GN (11c)

Remarks on the Application of the "Rules for Welded Steel Constructions," with Examples. (Ausführungen über die Anwendung der "Vorschriften für geschweisste Stahlbauten" mit Beispielen.) H. Schmuckler. *Elektroschweissung,* Vol. 2, July 1931, pages 127-139; Aug. 1931, pages 148-150.

This is a commentary on "Vorschriften für geschweisste Stahlbauten" (*Elektroschweissung,* Vol. 2, June 1931, pages 103-108) as they have been set up by the Fachausschuss für Schweisstechnik of the Verein Deutscher Ingenieure in coöperation with Ausschuss für einheitliche technische Baupolizeibestimmungen and the Deutschen Reichsbahngesellschaft. Part I refers to the practice to be followed in building construction, Part II to bridge construction. See also the paper by F. Merkel "Kritische Betrachtungen der Vorschriften für geschweisste Stahlbauten" (D I N 4100) *Elektroschweissung,* Vol. 2, Sept. 1931, pages 177-180. GN (11c)

Economics of Arc Welding. A. E. Steiger. *Mining Congress Journal,* Vol. 18, July 1932, page 36.

Discussion of practical economies derived from the use of arc welding. The greatest advantage of arc welding is that by its use repairs can be made without removing the parts which have failed. The writer sums up by saying that the arc weld is one, if not the most important, of repair tools. DTR (11c)

The Span-Weld System. E. F. Spanner. *Welder,* Vol. 3, June 1932, pages 1-5.

The problems of designing substantially flat steel plate diaphragms intended to resist pressures at right angles to their planes are discussed; such diaphragms occur in ship construction such as tank bottoms, tops and sides, or hull-plating. They are usually made up of a number of structural elements; a few methods of joining them are illustrated. Ha (11c)

Careless Welding Repair of a Boiler. (Unsachgemässe Kesselausbesserung mittels Schweissung.) *Zeitschrift des Bayerischen Revisionsvereins,* Vol. 36, Apr. 30, 1932, pages 97-98.

A case is reported on the repair of a ship boiler by electric welding. When the boiler was tested the welding proved to be faulty due to poor workmanship. GN (11c)

Arc Welding of High Conductivity Joints in Copper. T. C. Stuart. *Engineering Journal,* Vol. 14, Dec. 1931, pages 600-601.

The bus bars which flank the batteries of tanks in a Cu refinery and make electrical connection with the anode plates at one side and the cathode plates on the other require a high conductivity joint. The successful development of arc welding for this purpose is described. VVK (11c)

Multiflame Tips for Welding Torches. W. A. Slack. *Welding Engineer,* Vol. 17, Jan. 1932, page 42.

A few welding torches for production welding having 2 or 3 flame tips are described. Ha (11c)

Changes of State and Stresses During the Welding of the Steel Construction of the Switching Station at Stendal. (Zustandsänderungen und Spannungen während der Schweissung des Stahlbaues für das Reiterstellwerk in Stendal.) W. Schröder. *Der Bauingenieur,* Vol. 13, May 6, 1932, pages 268-272.

During the welding of the above construction there were studied in particular the effects of shrinkage of the weld seams on the changes in shape and the stresses set up in the various structural parts. Measurements were carried out at 9 different welded sections of the whole construction. The author emphasizes that in designing constructions to be welded it is a point of extreme importance to have a precise knowledge of the stresses and distortions which can be caused during the later performance of the welding. GN (11c)

Electric Welded Pipe Line in Cairo. E. Tutt. *Welder,* Vol. 3, June 1932, pages 22-25.

Details of shipping, erecting and welding of 155 pipes of 6" length each are described; the diameters vary from 0.9" to 1.8", the wall thickness from ¼" to ⅜". Ha (11c)

Manufacturing Steel Pipe in Japan. Maurice Taylor. *Steel,* Vol. 89, Dec. 7, 1931, pages 31-33.

A description of the automatic shielded arc-welding process installed in the plant of the Kawasaki Dock Yard Co., Ltd., Kobe for making pipe of 1300, 1500 and 2100 mm. diam. and of the shielded arc process used for joining sections of pipe in the field. The present status of welding in Japan is discussed. JN (11c)

Factors Affecting the Welding Qualities of Steel. W. E. Stine. *Yearbook American Iron & Steel Institute,* 1931, pages 486-510; *Engineering,* Vol. 133, Feb. 19, 1932, page 235.

See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 71. (11c)

Electrically Welding Gasometers. (Elektrisches Schweissen von Gasbehältern.) Schuster. *Gas und Wasserfach,* Vol. 75, Aug. 13, 1932, page 669.

Dutch experiences in repairing gasometers by welding. Welding proved satisfactory in technical regard, the costs of welding were rather high. GN (11c)

Electric Current Supply for Welding. D. A. Trickett. *Welder,* Vol. 3, June 1932, pages 30-32.

The power cost per 1000 hours for an arc of 100 amp. and 20 volts is tabulated for different types of generators. The lowest cost, £13 10s, was obtained with a machine of an inherently drooping characteristic from 60 to 20 volts with an overall efficiency of 62%, while the highest was £62 for a level compound machine with a series resistance in the weld circuit. Ha (11c)

WORKING OF METALS & ALLOYS (12)

Melting & Refining (12a)

A New Method for Production of Completely Deoxidized Iron Castings of Low Sulphur Content. (Ein neues rationelles Verfahren von vollkommen entoxydiertem Eisenguss von geringem Schwefelgehalt.) W. Hauly. *Schweizerische Technische Zeitschrift,* Vol. 29, May 5, 1932, page 277.

As a result of many years of practical and scientific research a new method has been developed for the production of Fe and steel with low S content. The paper gives no detailed information on the new process but states that it can be used for melts made in both the cupola and the open hearth furnace. The S content could be decreased from, for instance, .035% to less than .035%. The method can also be used in adding the alloying elements in making special alloys; practically without any loss of the alloy added. The elimination of O is performed in the ladle by a special deoxidizing alloy. There are added about 2 oz. of this deoxidizing alloy per ton of metal. By this method castings are claimed to be obtained absolutely free of segregations. GN (12a)

Re-melting of Electrolytic Nickel. (Umschmelzbehandlung von Elektrolytnickel.) *Die Metallbörse,* Vol. 22, Apr. 23, 1932, page 515.

Note on tests of Kuznetzov & Baranov (*Sobshenia Vsesoyuznogo Istituta Metallov,* 1931, pages 93-104) who aimed at a determination of the factors responsible for the irregular properties of remelted electrolytic Ni. The duration of the remelting procedure exerts a decisive influence on the properities of Ni due to an increase of the content of the low oxide of Ni. Maintaining a temperature slightly below the m.p. for 2 hours, succeeded by 10 min. in the liquid state, the NiO content amounted to 2.45-2.64% and to 5.85-6.1% after 50 min. C seems to furnish a suitable deoxidizer, but a surplus tends to graphite formation at the grain boundaries. Mn tends to form Mn oxide which impairs the physical properties, but Mn removes dissolved gases and S. Mg yielded still better results as a desulphurization means. The authors suggest an addition of 0.5% charcoal. After the C content dropped to 0.1% an addition of 0.3% Mn (0.2% Mn in case of Ni later used for forging purposes) is employed. Finally 0.1-0.14% Mg are introduced as a Ni-Mg intermediary alloy. EF (12a)

The Refining of Nickel. (Zur Raffination des Nickels.) E. T. Richards. *Die Metallbörse,* Vol. 22, May 28, 1932, pages 673-674.

The effect of S, C, Si, H_2 (electrolytic Ni), O_2 (deoxidized with Mg) and Ni sulphide (Merica & Waltenberg) on the ductility of Ni is dealt with. Stress is laid on the detrimental effect of S due to the low solubility of sulphides in Ni (0.005%), their low m.p. (Ni-NiS eutectic at 620° C.) and their accumulation at the grain boundaries. The inferior properties of S bearing Ni at elevated temperatures are self-explanatory. The m.p. of Ni oxide is 1650° C., while the Ni-NiO eutectic melts at about 1400° C. as compared with 1450° C., the m. p. of pure Ni. At low concentrations, O_2 does not exert a very harmful effect on the physical properties. But this does not hold true for less pure commercial brands which contain Fe, Si and Mn up to 1% and over. They absorb more O_2 and show a different micro-structure. But even at the eutectic content of 1.10% O_2 the detrimental effect is not extraordinary. A table is presented showing the 3 American Standards according to the U. S. Federal Specification Board, No. 371, 1926. The German Standards allow the following maximum contaminations: 98.5 Ni + Co, 0.15 Cu, 0.50 Fe, 0.20 Si, 0.03 As, 0.03 S, 0.3 C and only traces of P, Mn, Sn, and Sb. The refining process of Ni does not offer great difficulties. The remaining percentages of Fe, Co, Mn, Cu, As, Sb, Pb and Zn are indifferent with respect to most of the commercial applications. Cu must be absent if Ni is used for galvanoplastic purposes. Si forms a silicide which only induces brittleness at higher concentrations. Fe in larger percentages increases the resistance towards oxidation. The 2 steps of the refining process of Ni (a) the deoxidation by Mn. Mg, and charcoal and (b) the desulphurization are fully dealt with. The drawbacks of Mn for both purposes are pointed out, while the application of 0.15-0.20% Mg for the refining process are strongly recommended. Sometimes Mn is used as a deoxidizer (0.2%) followed by the desulphurization by Mg (0.1%). The latest suggestions of Kutzenow & Baranov (Abstract above) are critically discussed in conclusion. EF (12a)

Casting & Solidification (12b)

Melting and Casting Nickel-Silver Alloys. Edmund R. Thews. *Metallurgist,* Feb. 1932, pages 21-22.

Recommended practice for melting and casting Ni-Ag alloys is as follows: Cu, Zn, and Ni should not be added as such in making up the charge but the Ni or suitable Ni-Cu alloys should be alloyed with brass and the brass added to the charge. All the components of the mixture are added at once. As soon as the charge commences to melt, a few handfuls of table salt or sea salt are thrown into the crucible and heating continued until the metal is thoroughly fluid. The best pouring temperatures usually lie about 300° F. (150° C.) above the melting point of the alloys handled. At this temperature about ¼ oz. Al/100 lb. of metal is added for deoxidation purposes and the metal is then poured without delay. Successful pouring of the alloys is dependent on the maintenance of a narrow range of temperature depending on the composition of the alloy. Molds and cores should be made of fine, highly refractory sand, moderately moistened and for facing material a 30 : 1 mixture of finest sand with graphite will improve the smoothness of the casting surface. In sand castings the shrinkage of Ni-Ag averages 1.8%; chill castings about 2%. Chill molds are preferably filled from below and held for 30 minutes. The mold walls are coated with a mixture of turpentine and lampblack applied by a brush. VVK (12b)

The Action of Cast-in Chills on the Density and Strength of Castings of Bessemer Steel. (Die Einwirkung von eingegossenen Kühlkörpern auf die Dichte und Festigkeit von Bessemerstahl-Gussstücken.) E. LANZENDOERFER. *Die Giesserei,* Vol. 19, May 13, 1932, pages 181-186.

Cooling bodies are often used for the elimination of formation of pipes as they withdraw heat from the molten steel during pouring into the mold so that the steel crystallizes onto the cooling material. Such cooling materials can be made of simple nails, pieces of Fe, spirals, etc. The behavior was investigated by casting at 1600° C. cooling bodies of 80 mm. length and 8 x 8 mm. section, 32 g. weight, into castings of different sections and 80 mm. height; the surface of the cooling nail was rusty, clean and tinned with different compositions of a Sn-Pb alloy. The casting was subject to tensile tests and the surface examined microscopically. The results are given in detail. It can be stated that the application of cooling pieces is of advantage in all cases where pipes can be expected in a casting due to its complicated shape, especially where many bosses or flanges have to be cast on so that it would not be economical to provide so many gates. Although the strength and density of the casting is generally not very much impaired and the formation of pipes often prevented, gates should preferably be provided instead of cooling pieces when a casting has to be of best quality as cooling bodies always leave some uncertainty as to the result. Ha (12b)

Rolling (12c)

Lubrication of Roll Neck Bearings Requires Special Attention. RALPH C. WALTER. *Steel,* Vol. 90, Feb. 1, 1932, pages 31-33.

A discussion of the special lubrication problems involved in handling antifriction bearings of large size and capacity such as those developed for use in four-high, continuous, hot strip mills for rolling steel plate. JN (12c)

Application of Tapered Roller Bearings in Merchant Bar Mills. S. M. WECKSTEIN. *Transactions American Society of Mechanical Engineers,* Vol. 54, Apr. 30, 1932, Iron & Steel, pages 29-35.

Details of construction, field of application, experiences in operation and comparisons with other types of bearings are compiled; considerable power savings were made due to elimination of friction losses and also due to smaller driving motors. Ha (12c)

Roll Pass Design. XXXVII-XI. W. TRINKS. *Rolling Mill Journal,* Vol. 6, Jan. 1932, pages 15-17; Feb. 1932, pages 55-58, 65; Mar. 1932, pages 103-106; Vol. 7, No. 1, 1932, pages 25-30.

Outlines methods of rolling I-beams and factors which determine the methods that may be employed for each size of beam. Discusses diagonal, Slick, and universal-mill methods of rolling I-beams; rolling wide I-beams with narrow flanges; rolling small and large T-shapes; rolling T-sections on the diagonal; and methods of rolling rails. MS (12c)

Application of Impregnated Fabric Bearings to Roll Necks. ARTHUR J. SCHMITT. *Transactions American Society of Mechanical Engineers,* Vol. 54, Apr. 30, 1932, Iron & Steel, pages 25-27.

Results of tests with bearings of celeron which consists of sheets of woven fabric impregnated with resin are given. The hardness of the material is about 40 Brinell, its compressive strength is about 35,000 lbs./in.^{2}, its tensile strength 17,000 lbs./in.^{2} The load carrying capacity ranges from 1,000 to 2,500 lbs./in.^{2} of projected bearing area. The celeron bearing can be lubricated with water but oil or grease improves the performance appreciably; it is most efficiently used on highly polished roll necks with great savings in power cost and many times the life of a metal bearing. Details of construction are described. Ha (12c)

Notes on Chilled Rolls and Their Subsequent Failure in Service. D. J. THOMAS. *Blast Furnace & Steel Plant,* Vol. 20, Feb. 1932, page 200; Mar. 1932, page 288; Apr. 1932, page 364; May 1932, page 448.

Chief cause of the breakage of rolls is uneven or eccentric chill. Irregular chill is due to the unequal departure of the roll body from the chill mold during contraction. As a means for holding the roll centrally within the mold, so that even chilling can take place, the usual molds have a number of beveled grooves bored in the inner circumference. 2 are placed equidistant from the upper end, and 2 are placed equidistant from the bottom end. Thus, corresponding projections are formed on the surface of the roll bodies when the rolls are cast. During shrinkage, beveled edges of projections bear on the beveled edges of the grooves, causing the roll to depart from all sides evenly. Projections on largest roll should be not more than 3/16". MS (12c)

Modern Processing of Threads. (Moderne Gewindeherstellung.) A. PAMPEL. *Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, May 10, 1932, pages 56-57.

The paper shows that threads are more accurately made by rolling than by cutting. GN (12c)

Plastic Deformation in Theory and Experiment. *Metallurgist,* Feb. 1932, pages 22-24.

Extended abstract of a paper by E. Siebel, *Stahl und Eisen,* Vol. 50, Nov. 26, 1931. See *Metals & Alloys,* Vol. 3, July 1932, page MA 220. VVK (12c)

Reconstruction of a Three-High Mill for Rolling Wide Strip or Bar Iron. (Umbau einer Triostrasse für Walzung von Breitem Bandeisen.) L. PLETSCH. *Stahl und Eisen,* Vol. 52, June 9, 1932, pages 563-565.

Description of the rebuilding of the 3-high mill in the Werke Javornik (Südslawien) to permit rolling of bar Fe or Fe strip up to 420 mm. wide and 2 mm. thick. Fe plate 35 mm. thick and 1500 mm. long were used for producing the finished products. Automatic passage of the material was used and the general 3-high mill features were retained. A second heating furnace was necessary due to the increased rate of production. DTR (12c)

A New Separating Machine for Finished Sheets. F. CHRIST. *Engineering Progress,* Vol. 13, June 1932, pages 129-130.

See *Metals & Alloys,* Vol. 2, Dec. 1931, page 313. (12c)

Cold Rolled Metals. A. L. MOLINEUSE. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 93-96.

Apparatus used in the production of cold rolled sheet and strip is described. The high "1931" standard of surface, flatness and accuracy are discussed. PRK (12c)

Development of New Equipment. GEORGE T. LADD. *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, page 280.

Outline of rolling-mill equipment installed in 1931 or under construction at present by the United Engineering & Foundry Co. MS (12c)

Electrical Developments in 1931. A. F. KENYON. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 56-57.

Reviews application of electric drives to rolling mills of the Illinois Steel Co., Duquesne plant of the Carnegie Steel Co., Ellwood City works of the National Tube Co., Algoma Steel Corp.'s Sault Ste. Marie Mill, Republic Steel Corp. and a sheet mill. These were or are being installed by the Westinghouse Electric & Mfg. Co. MS (12c)

Metal Rolling in Mass Production. JAMES R. CORNELIUS. *American Machinist,* Vol. 76, Jan. 7, 1932, pages 2-7.

Describes and illustrates cold rolling processes as practiced in England. Describes some of the machines used. RHP (12c)

Influence of Temperature and Foreign Metals on the Rolling of Zinc. (Einfluss von Temperatur und Fremdmetallen auf die Walzbarkeit von Zink.) O. BAUER & P. ZUNKER. *Metallwirtschaft,* Vol. 11, May 20, 1932, pages 289-292; May 27, 1932, pages 303-306.

7 references. 2 grades of Zn were used, refined Zn containing 1.12% Pb and .11% Cd, and electrolytic Zn containing .015% Pb. Test sheets 8 mm. thick were reduced by rolling in .2 mm. steps. The ease of rolling increases regularly with increase in temperature for both grades of Zn. Below 110° C. good results cannot be obtained, the sheets crack. At 110° and 130° a few small cracks appeared in the refined Zn, but disappeared at 150°. The claim of other investigators that rolling temperatures of 120° to 140° were particularly unfavorable were found to be not true. With increasing amount of deformation and rolling temperature the coarse casting structure changes to a fine grained rolled structure. The start and finish of this change occurs at a lower temperature in electrolytic Zn than in refined Zn. The addition of Pb to electrolytic Zn has no influence on the ease of rolling. The other metals were added to refined Zn only. Cd is harmful if present above its solubility in Zn, which is .25% at room temperature. Cu does not influence the ease of rolling provided the temperature is above 110°. Fe above .1% is harmful unless the rolling temperature is above 150°. Sb has no effect provided the temperature is high enough. Sn is the most harmful of any of the metals tested. Even .1% produces cracks and its effect is not overcome by higher rolling temperatures on account of the eutectic it forms with a low melting point. CEM (12c)

Push Bench Process for Manufacture of Seamless Tubes. WM. H. ENGELBERTZ. *Rolling Mill Journal,* Vol. 6, Mar. 1932, pages 91-96.

Discusses the development of the modern push bench process or the so-called improved Ehrhardt process. Billet is perforated in a hydraulic punching press. Hollow cylinder is then stretched over a long mandrel on a push bench. Tube passes through a reeling machine which loosens the tube on the mandrel and evens and smooths the tube wall. Tube then passes through a set of sizing rolls, and, after leaving the cooling rack, is straightened in a set of cross rolls. Advantages of push bench process are its high output and low production costs. For economical reasons no tubes under 2½" outside diameter are made on the push bench. If products of smaller diameter are required, tubes from the push bench are reheated and passed through a reducing mill. Tabulates output of small type push bench plant. Comparison of the costs of production of tubes by the push bench, butt-weld and electric-weld processes shows that only the continuous butt-weld mill (Moon) can produce a cheaper product than the push bench. MS (12c)

Sheet and Tinplate Rolls. J. SELWYN CASWELL. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, page 111.

Part of an abstract from *Proceedings South Wales Institute of Engineers,* Vol. 46, pages 310-432. See *Metals & Alloys,* Vol. 2, Jan. 1931, page 11. MS (12c)

Aluminium Sheet Production. Part XIII. Finish Rolling. ROBERT J. ANDERSON. *Metallurgia,* Vol. 6, May 1932, pages 11-14; June 1932, pages 45-48; July 1932, pages 85-86; Aug. 1932, pages 121-122.

A detailed description of equipment and technique. JLG (12c)

Lignum Vitae Bearings for Roll Necks of Medium-Sized Rolling Mills. K. W. ATWATER. *Transactions American Society of Mechanical Engineers,* Vol. 54, Apr. 30, 1932, Iron & Steel, pages 1-2; abstract, *Rolling Mill Journal,* Vol. 7, No. 1, 1932, pages 19-20.

The often unsatisfactory performance of metal roll-neck bearings is pointed out and the experiences with bearings of various species of lignum vitae described. They were cooled by water spray. The rate of wear and the power loss in friction were found to be considerably lower than in metal bearings with oil or grease lubrication. Savings in power up to 23% and a 15 times longer life than in metal bearings were observed. MS+Ha (12c)

Machining (12g)

Electrical Testing Equipment for Machine Tools. (Elektrische Prüffeldeinrichtungen für Werkzeugmaschinen mit Einzelantrieb und für Werkzeuge.) E. LÖTTERLE. *Werkzeugmaschine,* Vol. 36, May 31, 1932, pages 175-178.

Detailed description of all the various electrical instruments used to supervise the performance of machine tools. There are also discussed the methods for supervising the performance of the tools used for machining, for measuring the cutting speed, electrical measuring boxes and electrical torsional dynamometers for measuring the cutting pressure, optical and mechanical measuring instruments for studying the cutting performance of the tool. It is emphasized that such equipment cannot be dispensed with for supervising and improving the quality. GN (12g)

The Newer Cutting Tool Materials. A. L. De Leeuw. *Mechanical Engineering,* Vol. 54, May 1932, pages 329-334, 353.

The outstanding materials for modern cutting tools are W and Ta carbides which do not lose their hardness until at a very high temperature. They are sintered materials and have therefore not the strength of solid metals. W carbide shows an affinity for steel which causes small pieces of it to weld to the tool. These properties required the development of a special technique for the support and arrangement of the tools; the practices for various kinds of metal working are described. Ha (12g)

Haynes Stellite Cutting Tools. W. A. Becker, E. E. Gordon & W. A. Wissler. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 93-100.

Haynes stellite is a non-ferrous alloy consisting essentially of Co, Cr and W. The cutting material most used, Stellite No. 3, has the following physical properties: Brinell 600, Rockwell C 61, tensile strength 38,000 lbs./in.^{2}, compressive strength 311,000 lbs./in.^{2}, cantilever strength ½ in.^{2}, 1 in. overhang, 2500 lbs. Its most important property is red-hardness which was tested up to 1100° C.; at 850° C. it is still 49 Rockwell C. Used for milling it shows a decided superiority over high-speed steel; it can be used equally well for cast Fe, semi-steel, malleable Fe, bronze, etc. It is not good for automatic or semi-automatic cutting machines. The manner of using it in different machining operations is described. See also *Metals & Alloys,* Vol. 2, Feb. 1931, page 43. Ha (12g)

Tool Steel Tools. A. H. D'Arcambal. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 101-109.

The 3 factors which govern the life of tool steel tools are proper design, kind of steel used, and treatment. The progress made in materials for machining and preparing machine tools is reviewed. See *Metals & Alloys,* Vol. 2, Feb. 1931, page 44. Ha (12g)

Time Calculations in Machining. (Il calcolo dei tempi nelle lavorazione meccaniche.) T. Bruzzone. Ulrico Hoepli, Milan, 1932. Paper, 6½ x 9½ inches, 105 pages. Price 15 Lire.

Deals with calculation of proper machining speeds, feeds and depths of cut for various types of machining operations on hard iron, steel of various tensile strengths, gray iron, bronze and brass, according to the methods of Taylor. Nomographic charts are provided and a slide rule, similar to that of Barth, is described. One example assumes the use of "superior high speed steel" of 17.8% W, 5.9% Cr, 0.93% V, which would indicate the use of higher Cr in Italian high speed steel than is customary here. Tungsten or tantalum carbide tools are not dealt with. H. W. Gillett (12g)-B-

Manufacturing Dies and Molds by the Hobbing Process. L. Doerfler. *Modern Machine Shop,* Vol. 5, July 1932, pages 12-17.

Dies and plastic mold cavities are readily reproduced by means of a "hob" upon which is duplicated, in shape and surface details, the design of the piece that is to be made. This hob is forced cold into a cold block of steel to the necessary depth to obtain the impression desired. The process and the method of working are described in detail. Ha (12g)

Machining Properties of Some Cold-Drawn Steels. O. W. Boston. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Machine Shop Practice, pages 41-55.

See *Metals & Alloys,* Vol. 2, Feb. 1931, page 44. Ha (12g)

Machining an Aluminum Piston. A. P. Gwiazdowski. *American Machinist,* Vol. 76, Feb. 25, 1932, pages 264-266.

Discussion of the various machining operations dealing with machining cycles, clutching positions, speeds and feeds, and diamond boring of the wrist pin holes. RHP (12g)

Working of Glass with Widia Tools. (Bearbeitung von Glas mit Widia Werkzeugen.) A. Fehse & B. Kindt. *Glastechnische Berichte,* Vol. 10, Apr. 1932, pages 193-200.

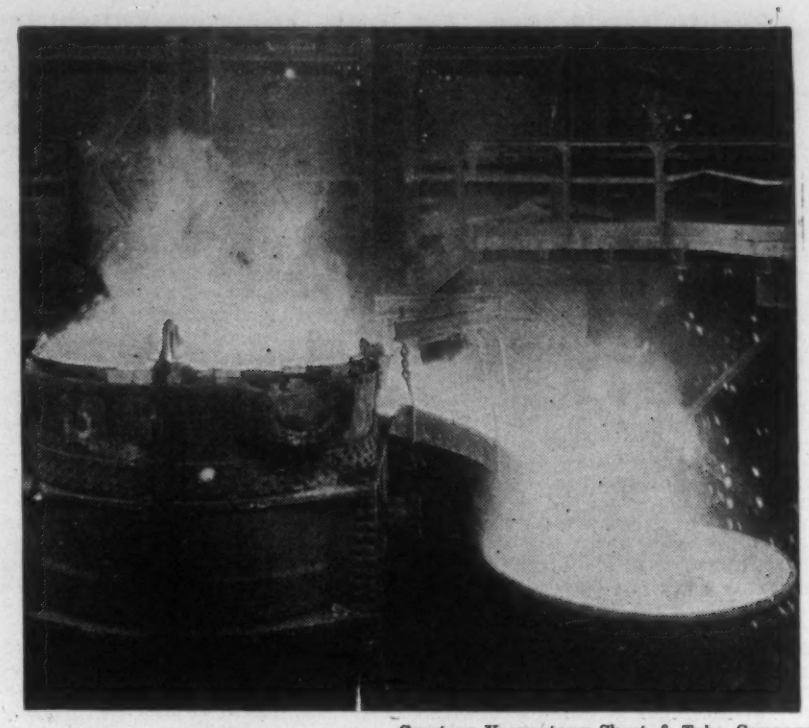
A very great number of examples and photographs show the applicability of Widia (tungsten carbide) tools for the shaping of glass. As it is extremely difficult to give bodies of pressed or cast glass the exact shape desired they can now be machined to exact dimensions easily and cheaply. Rough turning can be done with a chip of 3 mm., finishing usually with 0.1 or 0.2 mm. The cutting velocity is 60-100 m./min. As a particularly interesting piece of work of machined glass the photograph of a calendar of glass is shown. Ha (12g)

Influence of Chemical Composition and Heat Treatment of Steel Forgings on Machinability with Shallow Lathe Cuts. T. G. Digges. *Transactions American Society of Mechanical Engineers,* Vol. 54, Feb. 15, 1932, Machine Shop Practice, pages 49-59.

See *Metals & Alloys,* Vol. 2, Nov. 1931, page 271. Ha (12g)

Is there at Present any Unique Factor for Valuation of High Speed Tool Steels? (Gibt es heute schon einen einheitlichen Wertmesser für Schnelldrehstähle?) A. Hofmann. *Maschinenbau,* Vol. 11, Feb. 4, 1932, pages 45-46.

The value of high speed tool steels is dependent on the percent of its alloy constituents and on the melting practice in the steel plant. The influence of the various elements is explained in detail. W must be present by more than 14% to guarantee sufficient stability at high temperatures. To use more than 22% would be wasteful because of the excessive carbides not being dissolved in the solid solutions. To get the full effect of the important W content, 4-6% Cr and 0.6-0.85% C must be present for formation of the necessary carbides. Above this percentage of Cr and C, tools turn brittle and incline to cracking. More than 1% Mo is dangerous by increasing grain size and corresponding brittleness. V is very valuable for its deoxidizing effect and its rendering the steel less sensitive. It substitutes for or supports the effect of W to some extent. As much as 3% are used. Co is added up to 6% in American practice, in Germany up to 10% and in England as high as 20%. Tempering stability and heat conductivity are chiefly improved. To exceed 10% is said to be uneconomical. Ta and Ti carbides are mentioned as further bettering the quality. The importance of the melting, pouring and subsequent rolling or forging practice are pointed out. It is shown to be wrong to judge the grade of tools by the amount of their so-called alloy units, counting 1% W as 1 unit, 1% Co as 7.5 units, etc., but no other standard of valuation is offered. RV (12g)



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Quality Specifications for Tools. (Gütevorschriften für Werkzeuge.) FETZER. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Apr. 10, 1932, pages 41-42.

Paper stresses importance of cöoperation between manufacturer and consumer. GN (12g)

Influence of the Shape of the Chip on the Cutting Speed. (Einfluss des Spanquerschnitts auf die Schnittgeschwindigkeit.) S. F. GLEBOFF-HEINTZ. *Die Werkzeugmaschine,* Vol. 36, Aug. 15, 1932, pages 275-278.

The paper discusses the question whether, in studying cutting pressure and cutting performance of a tool, it is sufficient, according to the proposal of Nicholson, to consider the cross-section of the chip as the one variable value or whether it is necessary to simultaneously consider feed, depth of cut, thickness and width of cut, cutting angle, etc., as Taylor has done. The author calculates the error when the Nicholson method is used instead of the Taylor method. GN (12g)

The Roughness of Machined Metallic Surfaces. (Die Rauhigkeit bearbeiteter Metallflächen.) W. FRITZ. *Forschung (Zeitschrift Technische Mechanik und Thermodynamik)* Vol. 3, Mar.-Apr. 1932, pages 103-106.

The paper deals with the practical suitability of the various methods of studying the surface condition of machined surfaces of metals. (1) The cast method (gelatin) is applicable when, without claim to a high degree of accuracy, an approximate insight into the roughness of the surface is desired. (2) The optical (reflection) method is suitable for comparative measurements on ground surfaces (glass) when the unevenness is in the limits of from 2-6 μ. The method fails for quantitative determinations of roughness. (3) The mechanical (touch) method with photographic recording is most adaptable. The results of tests on steels, gray cast Fe, red brass and Lautal are reported. For brass, drawing and rolling give about the same roughness. 2 references. GN (12g)

Cutting Diamonds. (Schneiddiamanten.) B. FETZER. *Werkzeugmaschine,* Vol. 36, May 15, 1932, pages 159-161.

The paper first discusses the points which are to be borne in mind in selecting diamonds for cutting tools. The capacities and properties (hardness, elasticity, effect of temperature, admissible cutting speed, feed, depth of cut and cutting performance) of high speed steel, Widia and diamond are dealt with and compared. For a successful use of diamonds it is of extreme importance to choose the depth of cut and the feed as low as possible but the speed of cutting as high as possible. The duration of life of the diamond essentially depends on a careful fastening of the diamond on the tool shank. The cutting angles are given. The most favorable conditions for turning and drilling the various metals, alloys and other materials with diamonds are tabulated. GN (12g)

Drawing & Stamping (12h)

Die Pressing of Brass and Copper Alloys. JOHN R. FREEMAN, JR. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 329-335.

Includes discussion. See *Metals & Alloys,* Vol. 2, Mar. 1931, page 72. (12h)

The Use of Hard Metals in the Wire Drawing Trade. (Die Verwendung von Hartmetallen im Drahtziehereigewerbe.) C. AGTE. *Die Werkzeugmaschine,* Vol. 36, Aug. 15, 1932, pages 281-283.

Outline of the use of Widia and similar hard metals for drawing dies and accessories such as gages, pliers, etc. Data on capacities are given. The power consumption in drawing through hard metal dies essentially depends on the lubrication. Die angles for various ferrous and non-ferrous metals are tabulated. Products drawn with such type dies are distinguished by highest accuracy of dimensions. GN (12h)

Advantages of Uniformity in Cutting and Stamping. (Vorteile der Vereinheitlichkeit beim Schnitt- und Stanzenbau.) A. PETERHANS. *Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 8, June 10, 1932, pages 71-74.

The author shows in a number of examples the economic advantages of standardized tools in cutting and stamping. See also *Metals & Alloys,* Vol. 3, May 1932, page MA 138. GN (12h)

The Pressing of Modern Patterns on the Friction Press and the Processing of the Tools Required. (Das Pressen moderner Guillochierungen auf der Friktionspresse und das Anfertigen der Werkzeuge hierzu.) *Deutsche Goldschmiedezeitung,* Vol. 35, July 30, 1932, pages 310-311.

Outline of the procedure in making patterns on Au and Ag ware. GN (12h)

Materials for Stampings. J. K. OLSEN. *Product Engineering,* Vol. 3, July 1932, pages 295-297.

The selection of stamping stock is mainly determined by material, thickness and temper. Of all materials used, steel is the cheapest and strongest. The applicability of various materials for different purposes is discussed and the grain direction in its relation to surface finish explained. Ha (12h)

The Organization of Stamping Technique, Its Standardization and Advantages for Plant Operation. (Die Gliederung der Stanzereitechnik, deren Normbestrebungen und Vorteile für die Betriebsführung.) MAX THIELE. *Zeitschrift für wirtschaftliche Fertigung,* July 1932, pages 73-78.

After dealing with the definition of cutting, punching, stamping, drawing and pressing the advantages of the organization of stamping plants are discussed as it has been devised by the "Ausschuss für Wirtschaftliche Fertigung." GN (12h)

The Production of Cart Wheels by Means of Drawing and Stamping. (Herstellung von Karrenrädern mittels Ziehen und Stanzen.) *Zeitschrift für wirtschaftliche Fertigung,* July 1932, pages 83-84.

Description of the procedure to be followed in manufacturing small size car wheels by drawing and stamping. GN (12h)

Typical Birmingham Metal Small Wares. F. JOHNSON. *Metal Industry,* London, Vol. 40, Jan. 15, 1932, pages 101-104.

The manufacture of buttons, medals and paper fasteners by power presses is described. PRK (12h)

Forming Properties of Thin Sheets of Some Non-Ferrous Metals. W. A. STRAW, M. D. HELFRICK & C. R. FISCHRUPP. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 317-328.

Includes discussion. See *Metals & Alloys,* Vol. 2, July 1931, page 136. (12h)

Press for the Making of Hollow Shafts. (Presseinrichtung für die Herstellung von Hohlwellen.) A. WINTER. *Das Werkzeug,* Supplement to *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Apr. 10, 1932, pages 47-48.

The press and its operation are described. GN (12h)

Wire: Machine and Single-Hole Drawing. RICHARD SAXTON. *Metallurgia,* Vol. 6, Aug. 1932, page 120.

Multiple die machines are not satisfactory for drawing high-strength wire because of the fatigue stresses set up at each reduction which can only be removed by allowing the wire to stand an hr. or so between draws. JLG (12h)

The Knowledge of Structure Displacement in Shaping and Its Utilization to Tool and Material to be Shaped. (Die Erkenntnis der Gefügeverschiebung beim Umformen und deren Nutzanwendung auf Werkzeug und Werkstoff.) MAX THIELE. *Zeitschrift für wirtschaftliche Fertigung,* July 1932, pages 78-83.

Theoretical and practical considerations on various shaping processes with special reference to the flow of material in stamping and drawing. GN (12h)

The Distortion of Wires on Passing Through a Draw Plate. G. I. TAYLOR & H. QUINNEY. *Institute of Metals, Advance Copy* No. 618, Sept. 1932, 13 pages.

Semicircular wires of 1/8" diameter were engraved with straight lines parallel and perpendicular to their axes. Pairs of these wires were drawn through dies and the distortion of the lines determined. When drawn through 3° dies the distortion of the lines produced by each pass diminished, and increased distortion did not occur after the 4th pass. Wires were also drawn through dies having increased tapers. As the angle increased distortion increased. Results are shown by curves and are analyzed mathematically. JLG (12h)

Cold Working (12j)

Forces and Power Requirements for Cold Drawing Wire. J. H. HITCHCOCK. *Rolling Mill Journal,* Vol. 6, Feb. 1932, pages 67-70; Mar. 1932, pages 107-110.

Summarizes results of recent research work in England and Germany. 5 references. MS (12j)

The Influence of Cold Work on the Strength of Brass and the Possibility of an Improvement by Heat-treating. (Der Einfluss der kaltmechanischen Bearbeitung auf die Festigkeit und die Möglichkeit einer Vergütung durch eine entsprechende Wärmebehandlung.) F. FREUDE. *Die Metallbörse,* Vol. 22, Feb. 20, 1932, pages 225-226.

Residual stresses from cold working of 70/30 brass led to failure in service. Tests on the remaining stock were performed to ascertain the cause of trouble. Etching in mercury nitrate for 15 min. resulted in cracking of the tube samples. Further experiments on cold-drawn 60/40 Cu-Zn alloys were carried out and the internal stresses were determined. A thermal treatment at 150° C. resulted in a material reduction of the residual stresses which were almost entirely released after the same samples were exposed to 250° C. for 3 hours. The strength properties were not affected by this heat-treatment. Comparative tests on a 64/36 and 70/30 Cu-Zn alloy yielded the same result. EF (12j)

Hammering and Forming of Sheets. (Martelage et Faconnage des Toles.) G. DUBOIS. *Cuivre et Laiton,* Vol. 5, June 15, 1932, pages 245-254.

The practice in Cu boiler shops is discussed and the laying out of shapes, the required material, shaping by hammering and the joining of the parts is described in detail and procedures illustrated by sketches and photographs. The author recommends the application of more engineering principles to operate more economically than is possible with the present rather arbitrary methods. Ha (12j)

Mathematical Derivation of Machine Time for Cold Rolling Mill Machines. (Rechnerische Ermittlung der Maschinenzeit an Kaltwalzwerksmaschinen.) KARL VEIT. *Stahl und Eisen,* Vol. 52, June 23, 1932, pages 617-618.

In a cold strip mill the time consumed on any machine may be computed mathematically. For example, on the cold rolls, given rolling diameter (d) and R.P.M. (η) of the rolls, the time is given by $t = \frac{100}{d \times \pi \times \eta}$, where t is machine time in min./100 m. length of strip. Rolling time is tabulated for different gage strip, from 0.2 to 2 mm., and for strip widths from 10 to 50 mm., for 100 kg. strip rolls. DTR (12j)

Cleaning (12k)

Degreasing in Chromium Plating. (Die Entfettung in der Chrom-Galvanotechnik.) RICHARD JUSTH. *Feinmechanik und Präzision,* Vol. 40, June 1, 1932, page 105.

See *Metals & Alloys,* Vol. 3, May 1932, page MA 139. Ha (12k)

Cleaning of Castings by Means of a Mixture of High Pressure Water and Sand. (Putzen von Gusstücken mittels eines Druckwasser-Sandgemisches.) FR. HUTH. *Emailletechnische Monatsblätter,* Vol. 8, Aug. 1932, pages 60-61.

A simple apparatus is described, recently constructed by a German foundry, in which the coarse quartz sand used for cleaning, and the fine-grained molding or core sand are recovered separately. GN (12k)

The Degreasing of Metal Parts and Quality Wares before Electroplating. (Einiges über die Entfettung von Metallteilen und Massenartikeln vor der Plattierung.) K. ALTMANNSBERGER. *Oberflächentechnik,* Vol. 9, May 3, 1932, pages 88-89.

The most used degreasing method is now the electrolytic which is often combined with a preliminary Cu-plating. A bath for this purpose with Fe anode is 4.25 kg. NaOH, 4.25 kg. calcined soda, 0.70 kg. sodium silicate, 0.20 kg. Al-silicate, 0.70 kg. Na-cyanide and 0.70 kg. cupro-cyanide. The mechanical and chemical methods of degreasing for small articles are briefly treated. Ha (12k)

DEFECTS (13)

Inclusions and Their Effect on Impact Strength of Steel. I, II. A. B. Kinzel & Walter Crafts. *Transactions American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 143-180, 181-195.

Includes discussion. See *Metals & Alloys,* Vol. 2, July 1931, page 136; Dec. 1931, page 315. (13)

Fractures in Boiler Metal. A. E. White & R. Schneidewind. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Fuels & Steam Power, pages 193-214.

A review of metallurgical examinations of a great number of failures of boiler materials is given and from it a classification as to the causes of failure was attempted. Bending, compression, tension and impact, all produce fractures predominantly through the grain; failure in such cases is accompanied by deformation of the crystals. Impact failures under some conditions may be produced with very little deformation. Fatigue cracks are always transcrystalline without deformation of the grain. Caustic embrittlement, due to alkaline liquors, produces intercrystalline cracks. The cause of many failures can be more or less satisfactorily traced by comparison with fractures produced in the laboratory. Ha (13)

CHEMICAL ANALYSIS (14)

Extension of the Customary Scratch Test for a Rapid, Approximate Determination of the Gold Contents of Gold Alloys. (Erweiterung der bisher üblichen, sogenannten Strichprobe, zur schnellen, annähernden Prüfung des Feingehaltes von Goldlegierungen.) Geo. Buchner. *Oberflächentechnik,* Vol. 9, May 3, 1932, page 89.

Making a scratch test with the Au alloy on a test stone and observing its reaction with certain acids, is reliable only if there are only Au, Cu and Ag present, but not as is the case in modern jewelry, Pt, Pd, Ni and others. A modification of this test permits dissolving all additions and determining the Au chemically. For Pt-addition a precipitation as K_2PtCl_6 is made. Ha (14)

Spectrum Analysis in Metallurgy. C. E. Eddy. *Chemical Engineering & Mining Review,* Vol. 24, Apr. 5, 1932, pages 239-240.

A brief review of the work done on the determination of Pb, Sn, Fe, Ni, Al, and Mn in brass by means of the spectrum. Also of Sn, Sb, Cd, As, Bi, Cu, Zn, and Ag in Pb alloys. The accuracy in estimation by optical methods is about 10% of the amount of the element present—amply sufficient for ordinary production control. Simultaneous determination of 2 or more constituents is a favorable feature of the method. An analysis requires about ½ hour, compared to 5 or more hours for a chemical analysis. WHB (14)

The Determination of Beryllium in Highly Alloyed Steels and in Ferro-Beryllium. (Ueber die Bestimmung des Beryllums in hochlegierten Stählen und Ferroberyllium.) Horst Eckstein. *Zeitschrift für analytische Chemie,* Vol. 87, No. 7/8, 1932, pages 268-285.

The determination of Be in ores is briefly discussed and it is explained how analyses by weight can be advantageously supplemented by spectrum analytical methods. For determination in steels the oxine-, alkali-hydroxide-, acetate-, tannin- and ammonium sulphide methods are described which all give good agreement and accuracy with consideration of other alloying components. Ha (14)

The Effect of Manganese and Aluminum Content of Steel on the Determination of Oxygen, Nitrogen and Hydrogen according to the Hot Extraction Method. (Ueber den Einfluss des Mangan- und Aluminiumgehaltes von Stahl auf die Sauerstoff-, Stickstoff- und Wasserstoff-Bestimmung nach dem Heissextraktionsverfahren.) W. Eilender & H. Diergarten. *Mitteilungen aus den Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 5 pages.

See *Metals & Alloys,* Vol. 2, Dec. 1931, page 315. Ha (14)

Testing Precious Metals with the Touchstone. I, II, III. C. M. Hoke. *Brass World,* Vol. 28, May 1932, pages 92-93; June 1932, pages 112-114; Aug. 1932, pages 159-160.

The first installment outlines the old methods of testing alloys for Au and Ag. The second installment deals with Pt and its alloys. The old touchstone method is extended and developed to include Pt, Ir-Pt, Pd and its alloys, dental alloys and both kinds of white gold (Ni-Au and Pd-Au) as well as solutions containing these metals. Part III deals with the detection of Pd and Ni in white golds, Pt, or dental alloys. $Hg(CN)_2$ serves as a test for Pd, forming a dense precipitate from the milky solution. WHB (14)

A Method for the Determination of Slags in Low Carbon Iron and Steel. (Metod för elektrolytisk slaggbestämning i järn och stal med lag kolhalt.) Ragnar Treje & Carl Benedicks. *Jernkontorets Annaler,* Vol. 116, Apr. 1932, pages 166-196; Summary in *Iron & Coal Trades Review,* Vol. 125, July 1, 1932, page 3.

The electrolysis is carried out in a vessel with 2 compartments separated by a diaphragm. The Fe sample, surrounded by a collodion sack for holding the slag, is used as anode in a solution of 0.1 N KBr and 10% Na citrate, while sheet Cu, in 10% $CuSO_4$ solution, is used as the cathode. A current density is maintained so that the potential drop between the anode and the solution is less than 1.23 V. With these conditions evolution of H_2 and O_2 is prevented and the MnO is attacked less by the electrolyte than by distilled H_2O. The liberated slag can be measured by centrifuging, but a machine driven centrifuge is necessary. Microscopic examination may also be used for identification of the slag particles. The authors have thus identified small octahedral crystals of Al spinelle for the first time in Armco Fe. Chemical analysis of the slag shows some metallic Fe. Colloidal SiO_2 produces a large increase in the slag volume. The composition of the slags run approximately 36% Al_2O_3; 62% FeO and 1.2% MnO for Armco Fe; and 3.9% Al_2O_3, 93.3% FeO and 2.8% SiO_2 for Lancashire Fe. In Si steels the slag is 40-75% SiO_2 and the remainder Al_2O_3. The oxygen contents calculated from the slag analysis correspond closely to those found by vacuum extraction. Work is in progress on a method for high C steels. Ha + HCD (14)

The Determination of Sulphur in Steel. (Über die Bestimmung von Schwefel in Stahl.) *Die Metallbörse,* Vol. 22, Apr. 20, 1932, page 499.

The most important methods are listed in the introduction and special attention is paid to the combustion method in O_2 according to Holthaus recently improved by Guedras, who burns S at 1200° C. and passes the combustion gases into NaOH. Na_2SO_4 is formed and the balance of NaOH is titrated. EF (14)

Sampling of Ores and Other Metallurgical Materials Containing Metal as Well as Metals and Alloys. (Probenahme von Erzen und anderen metallhaltigen Verhüttungsmaterialien sowie von Metallen und Legierungen.) Selbstverlag der gesellschaft deutscher Metallhütten- und Bergleute, Berlin 1931. Paper, 5¾ x 8¼ inches, 108 pages. Price 4 RM.

This booklet, issued by the German Institute of Mining and Metallurgical Engineers, appears as a companion to the second edition of "Ausgewählten Methoden für Schiedsanalysen kontradiktorisches Arbeiten bei der Untersuchung von Erzen Metallen und sonstigen Hüttenprodukten." Sampling was included as a separate chapter in the first edition of the above work, but in the second edition it was omitted and appears in the present booklet.

Methods of sampling have been revised and changed in many instances in this edition. Suggestions from the industry have been utilized in making revisions.

The last 38 pages of the book have been devoted to the following subjects: Commercial tolerance of common impurities and additions, and the splitting limits for analytical samples of metallic residues and furnace products; German specifications for scrap, waste, and ingot metal; and American standard specifications for scrap metal.

There is no index. John D. Sullivan (14)-B-

The Determination of Tungsten in High-Speed Steels as Tungstic Acid in the Gooch Crucible. (Die Bestimmung des Wolframs in Schnelldrehstählen als Wolframsäure im Goochtiegel.) H. Wdowiszewski. *Zeitschrift für analytische Chemie,* Vol. 87, No. 1/2, 1932, pages 36-38.

A modification of the usual method is described by which the content of W is determined from chips of the steel as H_2WO_4 instead of as WO_3. The procedure is described in detail. Ha (14)

Electro-Analytical Determination of Gallium. (Die elektroanalytische Bestimmung des Galliums.) Erich Reichel. *Zeitschrift für analytische Chemie,* Vol. 87, No. 9/10, 1932, pages 321-332.

Metallic Ga was deposited on Pt-Ir cathodes from a sulphate solution with the addition of NaOH. The Ga potential is about 0.6 volts; it was found that a bright, firmly adhering metal was obtained when the electrolyte was stirred, while without this, a loose, dark gray deposit was obtained. The temperature seems to have an influence on the H-voltage; the time of deposition is shorter at higher temperatures. The method and procedure to be observed are discussed in detail. Ha (14)

The Analysis of Bronze and Brass. (Die Analyse von Rotguss und Messing.) O. Niezoldi. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 12, 1932, page 246; June 26, 1932, page 268.

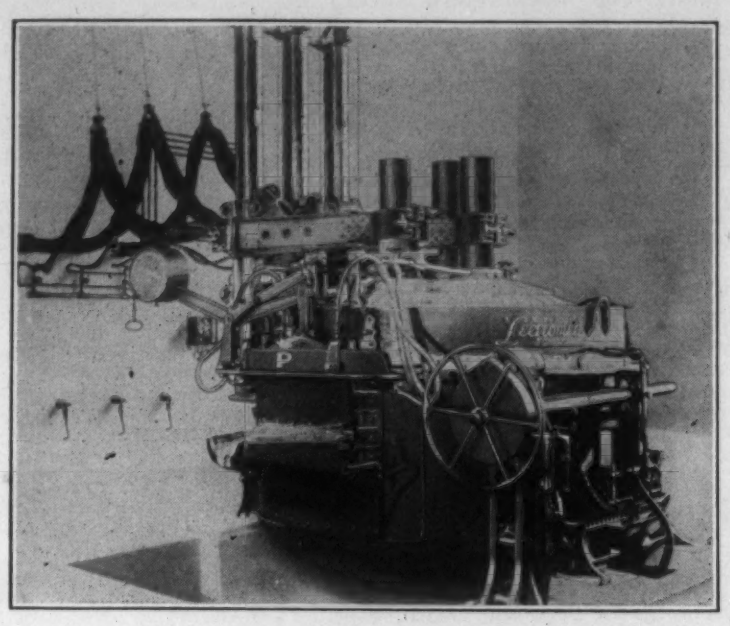
Determination of Pb, Fe, Al. Ni, S, Cu, Sn, Zn in brass and bronze. GN (14)

Detection of Traces of Mercury by an Electro-chemical Method. (Elektrochemischer Nachweis kleinster Quecksilbermengen.) E. Schmidt & E. Tornow. *Chemiker-Zeitung,* Vol. 56, Mar. 5, 1932, pages 187-188; Mar. 12, 1932, pages 206-207.

The test can be made in the presence of other metals and organic matter without previous separation. A graphite stick or carbon for an arc lamp is used as an anode and the cathode consists of a strip of Al .2 mm. thick. The solution is electrolyzed at 4 volts for 30 minutes. If Hg is present in the solution it acts as a catalyst and starts a reaction forming Al amalgam. The Hg goes back into solution leaving an oxidized area on the Al strip which is dull and can easily be distinguished from the bright metallic Al. When heavy metals are present the test is best made in H_2SO_4 solution and with the addition of some NaCl. To prove the effectiveness of the method tests were made with $HgCl_2$ and HgI_2 solutions containing $AgNO_3$, Na_3AsO_3, Na_3AsO_4, $CuSO_4$, $CdCl_2$ and other salts. The time required depends on the amount of Hg present and is longer in the presence of organic matter. The smallest amount of Hg detected in a pure NaCl solution was .001 mg. Quantitative determinations are not possible but the amount can be approximated from the size of the oxidized area, the current and the time. CEM (14)

The Place of the Emission Spectrum Analysis in the Metal Industry. (Die Rolle der Emissionsspektralanalyse in der Metallindustrie.) G. Scheibe. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, July 1931, pages 123-127.

The possibilities of using the emission spectrum analysis, that is, the detection of elements in a mixture or a compound by means of the optical spectra except X-ray spectra, are reviewed. Qualitative and quantitative determinations can be made. The particular advantages of this method are its very great sensitivity, in many cases 0.001%, the very small amount of material required, the fact that elements which give difficulty in chemical analysis do not disturb the spectrum analysis, and the speed and cheapness of the method. For very small percentages the method is superior to chemical analysis in quantitative determinations. Flames or sparks are used to excite the spectra; the respective methods and apparatus are described. A small spectrograph with ordinary glass lens system permits the determination of the following elements and their lowest amount in %: Cr 0.01, V 0.1, W 0.8, Mn 0.05, Ni 0.2, Mo 0.2, Si 0.2. A quartz spectrograph is still more sensitive. The Fe spectrum and those of Si, P, B and Cu can be determined to a few hundredths of a percent. The precautions to observe when fixing the spectrum photographically are explained and a photograph is reproduced. 10 references. Ha (14)



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FOUNDRY PRACTICE & APPLIANCES (22)

Steel Foundry Practice in a Jobbing Foundry. C. D. POLLARD. *Foundry Trade Journal,* Vol. 46, Apr. 28, 1932, pages 264-267.

This paper deals with the production of steel castings in a jobbing foundry where castings from 50-60 lb. to 20 tons and upwards are being handled consistently. Considerable attention is directed to the problems of venting, of the bracketing of castings, of the placing of runners, and of the heading and feeding of steel castings. Attention is paid briefly to the question of sand, and the article closes with a discussion of the annealing, heat treatment, and welding of castings, together with a short reference to schemes for controlling output and deliveries. OWE (22)

Should Molds be Weighted or Clamped? (Formen verklammern oder Formen belasten?) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 12, 1932, pages 237-239.

The advantages and disadvantages of both of the methods are discussed. Which one is better fit must be decided from case to case. Various methods of clamping molds are illustrated and discussed. GN (22)

Electric Furnace Iron for the Foundry. N. L. TURNER. *Iron & Steel of Canada,* Vol. 15, July 1932, pages 77-78.

This article may be considered an addendum to a paper presented before the American Foundrymen's Association in Cleveland in 1930, in which furnace practice and costs of operation of a 3-ton electric furnace at the Beach Foundry in Ottawa, Canada, are described. Since 1930 the cost of producing Fe in this electric furnace has been still further reduced, and it has been shown that the furnace is still more flexible in operation than was supposed in 1930. The author gives a table with details of the cost of operating the electric furnace for one month, quoting the figure $19.88 as the total cost of operation per ton of Fe. The article is also accompanied by 2 photographs. OWE (22)

Remarkable Points in Constructing Drying Ovens. (Beachtenswerte Punkte bei der Anlage von Trockenkammern.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, pages 326-328.

Practical hints are given to be borne in mind in building ovens for drying molds. The arrangement of the heating contrivances and the use of cars for drying molds is particularly dealt with. GN (22)

Italian Steel Foundry Practice. GUIDO VANZETTI. *Foundry Trade Journal,* Vol. 46, Apr. 21, 1932, pages 248-249; Apr. 28, 1932, pages 257-259.

The author, after dealing with the history of the steel industry in Italy, discusses the present available plants in that country and the importance of the electric furnace to the Italian steel manufacturer. A comparison is made between the Bessemer converter and the electric furnace, and attention is directed also to the position of the open hearth in the steel foundry. The author expresses his preference for the electric furnace and then deals with the choice of electric furnaces for the type of work with which his paper is concerned. Considerable attention is directed to the question of the "castability" of electric steel. The paper closes with a description of the Vanzetti Foundry in Milan. OWE (22)

Charges for Heat Resisting Castings. (Gattierungen für wärme- und feuerbeständigen Guss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 7, 1932, page 306.

Abstract of a paper by Auguste Le Thomas in *La Fonte,* 1932, pages 75-95. The following compositions are given for various uses: For parts not to be machined white Fe with 2.6-3.3% C, .6-1.2% Si, .3-.5% Mn, .08-.12% S, P below .6%. The good heat resistivity of such an Fe can be still improved by higher Mn content (2-3%) or from .3-1.0% Cr. Heat resisting cast Fe which is to be machined contains 2.8-3.0% C, in cases up to 3.4% C, .8-1.3% Si according to wall thickness, .7-1.0% Mn, .05-.09% S and P below .3%. This Fe is suitable for thick-walled parts and for simple shapes. For thin-walled and intricate parts which are easily machineable the following is suggested: 3.0-3.4% C, 1.3-1.6% Si, .7-1.0% Mn, .05-.09% S, P below .3%, .4-.8% Cr. Parts a few cm. in wall thickness are cast with 1.3% Si and .8% Cr, thinner parts with 1.5-1.6% Si and .4-.5% Cr. For obtaining high resistivity against heat, high mechanical strength, great structural uniformity and easy machinability the composition is advised: 2.8-3.2% C, 1.2-1.4% Si, .8-1.0% Mn, .05-.09% S, P below .3%, .5-.8% Cr and about 1.5% Ni. Fe of very high heat resistivity contains 1.5-2.0% Cr, about 13% Ni and 8% Cu. The composition of the corresponding charges is also stated. GN (22)

Quantity Production of Grey-Iron Castings. J. O'SULLIVAN. *Foundry Trade Journal,* Vol. 46, June 9, 1932, pages 350-353.

Paper presented at the Newcastle Meeting of the Institute of British Foundrymen, in which the Dagenham foundry recently opened by Messrs. Henry Ford and Son is the subject of complete discussion. OWE (22)

Introduction to the Study of Moulding and Casting. J. PILLON. *Foundry Trade Journal,* Vol. 46, June 23, 1932, pages 382-384; June 30, 1932, pages 400-404; Vol. 47, July 7, 1932, pages 7-10, 14.

The French exchange paper presented at the 29th Annual Convention of the Institute of British Foundrymen (June 7-10, 1932). The author introduces his paper by stating that these extracts from his lectures given at the Foundry High School in Paris are not intended for beginners but assume the possession by readers of a scientific training and a practical acquaintance with the art of molding and casting. The article is accompanied by 100 illustrations. The paper is divided into 2 sections—I. "Moulding and Metallurgy." In this the author discusses the investigation of the type of molding to adopt and deals fully with what he refers to as the parameters of molding. In this section attention is also directed to the method of using the pattern, to the investigation of partings, and to a discussion of hand-molding as a function of the system of partings. Methods that may be used for simplifying castings are dealt with briefly, and devices whereby rapid molding may be accomplished occupy some space in the article. II. "Static and Dynamic Forces Exerted by Molten Metal on Moulds and Cores. OWE (22)

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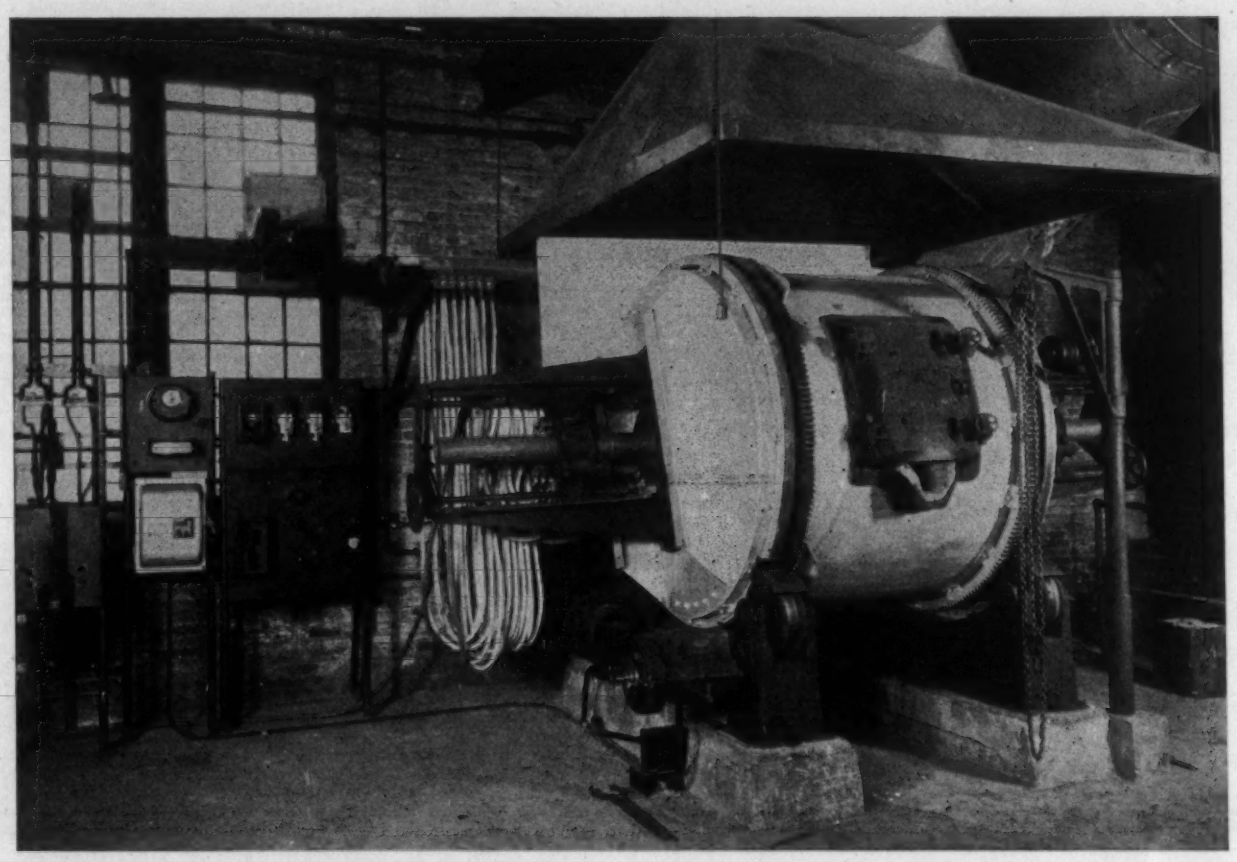

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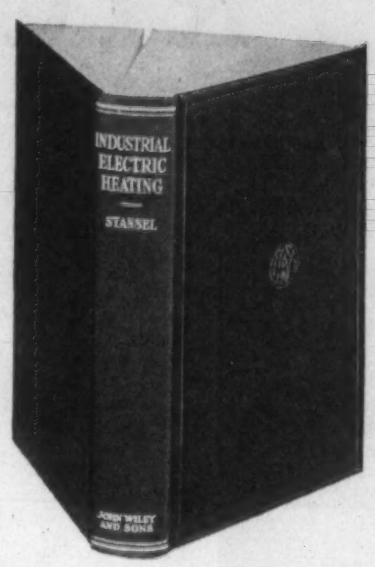

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FURNACES & FUELS (23)

Forging and Heating Furnaces with Long Distance Gas Supply. (Schmiede- und Wärmöfen mit Ferngasbeheizung.) H. REPKY. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 13, Feb. 1932, pages 39-41.

The reasons for the higher capacities of remote gas fired furnaces are enumerated (2-3 times that for instance of oil fired furnaces): (1) A larger heat capacity can be attained in the hearth without reaching excessive temperatures and superheating the product to be heated. (2) the temperature is more uniform, the heat transfer is higher since a higher temperature difference between hearth and piece can be chosen. (3) the heat absorbing surface of the charge is larger. When the combustion properties of coke gas are taken into consideration sufficiently in the construction and arrangement of the burners, dimensions and form of the hearth, the gas down-take, and the operation of the furnace, coke gas is much better for the above-mentioned purposes and more economical than any other fuel. GN (23)

Some Future Fuel Problems in Metallurgical Practice. H. C. ARMSTRONG. *Proceedings 3rd International Conference on Bituminous Coal,* Vol. 1, 1932, pages 652-656.

The problems are: (1) future use of high-S coal, (2) cleaning of fuel gas, (3) automatic thermostatic control, and (4) smoke elimination. See *Metals & Alloys,* Vol. 3, Apr. 1932, page MA 110. AHE (23)

American Gas Practice. Volume I. Production of Manufactured Gas. JEROME J. MORGAN. Published by the author, Maplewood, N. J., 1931. Cloth, 6¼ x 9¼ inches, 969 pages. Price $8.00.

This is the first of 2 volumes, which result from material prepared for a home study course in manufactured gas for gas company employees, which has been sponsored jointly by Columbia University and the American Gas Association since 1925. The author has received coöperation from a committee of leading engineers in the gas industry.

This volume covers the many processes for the production of fuel gas, taking into account the fundamentals of the processes and the technique of operating the equipment, and goes thoroughly into the details and fine points of commercial practice. The literature is referred to extensively for specific illustrations and operating data. The book is well illustrated with cuts of equipment which is in current use in the industry, often in duplication to include the units by various manufacturers.

Related and minor topics which are fully covered include the history, physics and chemistry of gas; occurrence and production of natural gas; heating of gas making apparatus; coal and its relation to coal gas; carbonization processes and equipment; gas works refractories; conveying, crushing and screening equipment; boiler plants, fuels and feed waters; condensing, exhausting and scrubbing; purification; liquefied petroleum gases; reforming of hydrocarbon gases; and gas conditioning.

The book is authoritative and up to date. Liberal use is made of reliable data from the literature and a good bibliography is appended to each chapter. It is a worth-while reference text. The last chapter, "Developments and Future Problems," gives a summary of the growth and development of the industry and an insight into its probable trend for the next few years. F. B. Hobart (23) -B-

A Review of Certain Gas Producer Practice. VICTOR WINDETT. *Year Book of the American Iron & Steel Institute,* 1931, pages 218-293. See *Metals & Alloys,* Vol. 2, Oct. 1931, page 230. (23)

Conditions Determining Electrical Blast Furnace Gas-Purification Practice. (Die Massgebenden Einflüsse auf den Betrieb der elektrischen Hochofen Gas-Reinigung.) KURT GUTHMANN. *Stahl und Eisen,* Vol. 52, June 2, 1932, pages 529-539.

Report 127 of Blast Furnace Committee of Verein deutscher Eisenhüttenleute. Extended tests were made on 3 blast furnace units to determine the effect on the purification action of electrolytic filters of temperature, moisture content, CO_2 content of inlet gases, gas velocity, amount and chemical composition of blast furnace gas, precipitation voltage and condition of electrodes. The most important variable is the adjustment of the moisture content to the temperature of the gases at the inlet to the filter, and in this lies the task in the operation of an electrolytic filter. An operating curve, derived from numerous operating tests, permits a simple control and operation of the Dry-ElectroFilter system at both the Elba Huckingen and the SSW Oberscheld blast furnace units. Gas saturated with steam or water vapor gives best electrical purification, and herein lies the progress from the Dry to the Wet-ElectroFilter. A combination of the dry and wet methods is the so-called Lurgi 2-stage system, the major part of the removal being in the dry state. In addition there is the Lurgi-Electro-Wet Filter which gives good purification in 1 stage by the wet process. A complete tabular comparison is given of the 3 different methods for all factors entering into the purification process, including overall costs. 17 references, 18 graphs and illustrations. DTR (23)

Coke Oven Gas in the Iron and Steel Industry. H. LENT. *Gas Journal,* Vol. 198, June 1, 1932, pages 502-510.

The application of coke oven gas to the Fe and steel industry in Germany is discussed. The different types of furnaces used include: continuous tempering furnaces with automatic temperature regulation for wire and strips; large tunnel furnaces with extended combustion zone for making refractory bricks for ceramic and sheet industries, etc.; continuous enamelling furnaces; continuous re-heating furnaces for high-speed rolling mills; portable forge furnaces for drop forgings; plate and sheet annealing furnaces adapted from producer to coke-oven gas for the sheet industry; a forge furnace with external recuperator made of heat-resisting steel for the attainment of the highest possible efficiency; a semi-portable forging furnace; a half-ton tilting furnace with overhead burners for melting Al; pot annealing furnaces for cold-rolled materials; continuous wire furnaces for soft wires, no muffle being needed, the unprotected wires being exposed to the furnace atmosphere; furnaces for annealing and heat-treatment of welded tubes. MAB (23)

Pulverized Coal Firing Cuts Costs in Malleable Foundry. FRANK S. O'NEIL. *Steel,* Vol. 90, Jan. 11, 1932, pages 23-25.

See "Combustion Equipment Revamping in Modern Production Plant proves Profitable," *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 280. JN (23)

Control Device for Combustion of Excess Gas in the Blast Furnace Hot Blast Stove. (Reglereinrichtung zur Verbrennung von Ueberschussgas im Hochofenwinderhitzen.) K. THEIS. *Stahl und Eisen,* Vol. 52, June 9, 1932, page 563.

Fuel losses of 3 to 10% on hot blast stove and blast furnace gas-fired coke ovens may be eliminated by the use of an electrical regulating or control device to take care of any excess gas. A diagram of the hookup is shown for burning any excess gas in the hot blast stove. DTR (23)

Blending Coal for Coke Making. R. A. MOTT & R. V. WHEELER. *Proceedings 3rd International Conference on Bituminous Coal,* Vol. 1, 1932, pages 587-606.

The initial contraction, initial expansion and final expansion temperatures and the % of such contraction and expansion are given for 18 English coals and compared with the mechanical strength index of oven coke from the same coal. The best coking coals are strongly swelling, inferior coking coals have low swelling power and non-coking coals are non-swelling. The coking of various sizes of coals and blends was studied using this test (4-6 g.), box tests (150-300 lbs.), experimental oven tests (500 lbs.) and large scale tests (10 tons). The addition of about 3% of fusain or 2.5% of coke breeze to coal increases the size and hardness of the resulting coke. AHE (23)

Improvement of Upper Silesian Blast Furnace Coke and Oxidation of Upper Silesian Coal. H. H. KOPPERS. *Gas World,* Vol. 97, Aug. 6, 1932, Coking Section, pages 10-14.

This abridged translation of thesis for degree of Dr.-Ing. at Technical College, Aix-la-Chapelle, Germany, describes experiments carried out on the production of coke for blast furnaces. See also *Metals & Alloys,* Vol. 4, Feb. 1933, page MA54. MAB (23)

Carbonizing Properties of Davis Bed Coal from Garrett County, Md., and of Mixtures with Pittsburgh Bed Coal. A. C. FIELDNER, J. D. DAVIS, E. B. KESTER, W. A. SELVIG, D. A. REYNOLDS & F. W. JUNG. *Technical Paper* 511, United States Bureau of Mines, 1932, 39 pages.

The Bureau of Mines method for determining the gas-, coke-, and by-product-making properties of coal at various carbonization temperatures from 500° to 1100° C. was applied to a low-volatile coal from the Davis or Upper Freeport bed, a high-volatile coal from the Pittsburgh bed and to 60:40 and 20:80% mixtures of these 2. The coke yields of the blends were in close agreement with the theoretical yields computed from the yields of the component coals and the proportion of these coals in the blends. AHE (23)

REFRACTORIES & FURNACE MATERIALS (24)

Distorted Magnesite Bricks. (Verdrückte Magnesitsteine.) K. A. GOSLICH. *Tonindustriezeitung,* Vol. 56, May 12, 1932, pages 511-512.

During burning the bricks are placed one on the other so that the lower layers are subjected to heavy loads; they crumple and then offer difficulties on lining furnaces, etc. The article describes the various reasons for this occurrence. Crumpling can be due to too high a content of fluxes (softening during burning and subsequently the danger of being crumpled is not so pronounced with bricks containing smaller amounts of fluxes) to an insufficient first burning so that the bricks do not sinter sufficiently, to an unfavorable grain size, to improper stamping while making the bricks. 3 references. GN (24)

The Expansion of Tschassow-Jar Fire Clay Bricks at High Temperatures. (Das Ausdehnungsverhalten von Tschassow-Jar Schamottesteinen bei hohen Temperaturen.) P. P. BUDNIKOFF & W. MÜLLER. *Berichte der deutschen keramischen Gesellschaft,* Vol. 13, Apr. 1932, pages 153-157.

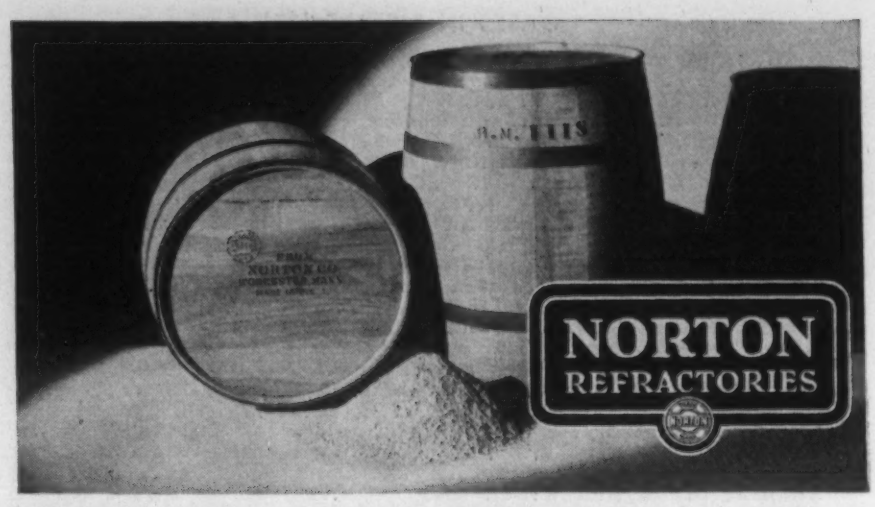
Report from the Central Research Laboratory of the Ukrainian Refractory and Cement Trust. The investigation shows that the determination of the heat expansion of refractories is of value not only for judging the quality but conclusions can be drawn as to the origin of the raw materials of the refractories. The Tschassow-Jar clays investigated are used in Ukrainia for manufacturing refractory bricks for industrial furnaces. The expansion curves of a great variety of refractory bricks were taken at temperatures between room temperature and 1100° C. and are shown in diagrams. GN (24)

Zirconium Oxide and Its Use in Industry. (Das Zirkonoxyd und seine Verwendung in der Technik.) HANS TRAPP. *Chemiker-Zeitung,* Vol. 56, Apr. 16, 1932, pages 306-307.

In nature ZrO_2 always occurs contaminated with hafnium oxide. Its melting point is about 3000° C., but has not been definitely determined. ZrO_2 has been used for high tension insulators. More scientific work is necessary to determine its melting point, thermal conductivity and electrical resistance. In regard to using it for firebrick its heavy weight when fired at 2000° and high cost must be considered. A new use for ZrO_2 is for melting crucibles CEM (24)

Sintering Dolomite with Gas. (Ueber das Dolomit-Sintern mit Gas, über die Gas feuerung von Schachtöfen und über das Verhalten von verschiedenen Dolomiten und von Kalk.) NIKOLAUS KIEFFER. Doctor's thesis, Technische Hochschule Aachen. Mimeographed, 8 x 11½ inches, 49 pages.

Instead of calcining dolomite with coke, a shaft furnace was provided with a group of burners and a mixture of 70-90% blast furnace gas and 30-10% coke oven gas used as fuel. The method has been in successful use for 4 years. The design of the furnace and the arrangement of the burners are shown in drawings. Greater furnace output than with coke and a cost reduction of some 30% are claimed. Various grades of dolomite were studied in the laboratory. The German dolomite sintered at 1100° C. while a purer foreign dolomite required 1400° C. or above. The gas method is considered applicable to readily-sintering dolomites and to lime stone, but not so suitable for difficultly-sintering dolomites. The theory of burning of dolomite is discussed. HWG (24)



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GASES IN METALS (25)

Oxygen and Its Influence on the Properties of Steel. G. VEINBERG. The Scientific-Chemical-Technical Institution, Leningrad, 1930. Cloth, 6¾ x 7½ inches, 275 pages. Price 5 roubles 50 kopeks.

This book appears to be a comprehensive and apparently an accurate critical review of the literature data on the subject as well as the author's observations. The author discusses different methods of oxygen determination, the oxygen content in Fe, steel and cast Fe and the effect of oxygen on the physical and mechanical properties of steel. Some of the conclusions drawn from the work of the author and references were as follows: 1. In a synthetic work one may use Armco Fe which contains 99.86-99.90% pure Fe, oxygen content varying from 0.020 to 0.092%. 2. In a precise work, it is better to use electrolytic iron, containing 99.99% pure Fe. (Abstractor's note: According to J. R. Cain, H. Schramm and H. H. Cleaves, "Preparation of Pure Iron and Iron-Carbon Alloys," *Journal Industrial & Engineering Chemistry*, 1916, page 217. Total amount of C, S, P, Mn, Si, Cu, Ni and Co in an electrolytic iron may be as low as 0.024%.) 3. Solid Fe may contain as much as 0.05% in a solid solution. (Abstractor's note: Presumably at room temperature.) The amount of oxygen which may be dissolved in liquid Fe at 1530° C. is 0.21%. In case the amount of oxygen present was above this limit (0.21%) there were 2 zones in the liquid metal and segregation of oxygen was pronounced. 4. Oxygen content of irons and steels have been shown in some cases to affect resistance of the metal to corrosion by air, sea water or 3% HCl solution. 5. The average amounts of oxygen present in pig and cast irons have been found as follows:

Coke pig Fe	0.022% O
Charcoal pig Fe	.023 " "
Cast Fe	.020 " "

6. Stainless 12½ Cr steel contained 0.012% O. 7. High speed, Ni and other special alloy steels may contain 0.007 to 0.014% O (probably as high as 0.022%). 8. Bessemer steel before deoxidation may contain up to 0.257% O and even more. On addition of spiegeleisen, O content may drop to 0.019%. The final O content varies in acid Bessemer steel from 0.006 to 0.018% and in basic Bessemer steel from 0.010 to 0.077%. 9. Thomas steel before deoxidation contains from 0.031 to 0.068%, whereas after deoxidation this content is 0.015 to 0.033%. 10. Acid open hearth steel contains a smaller amount of O than basic open hearth steel. With an increase in the content of C and certain other of the common impurities the amount of O decreases. For instance, with a total amount of impurities of 0.719% the O content was 0.034% and when the amount of impurities was 1.8% the O content was 0.021%. 11. Crucible steel contains 0.001 to 0.017% O. 12. In puddled Fe the O content may reach 0.603%. 13. In electric welding O is absorbed from the air and the O content in the weld metal is from 0.25 to 0.45%. 14. There is a difference between the O content of the bath of a molten metal and that of the solid castings produced. For example, the O content of the molten steel taken from the open hearth furnace was 0.025%, whereas O determined in rails was 0.021%. 15. There was observed a difference in the O content in molten metal before and immediately after pouring from the furnace into a casting. O is occluded from the air so that the ingot may contain 0.123%, whereas the liquid metal in the furnace contained only 0.0188% O. 16. O segregates but its segregation may proceed in the reverse order to the segregation of other impurities. 17. O lowers the melting point of Fe and steel. 18. Increase in O content may raise the temperature at which Charpy impact values reach a maximum. For instance with 0.086% O, the maximum Charpy value is obtained at 650° C., whereas with 0.23% O the maximum impact value is reached at 800° C. It is believed that the optimum forging and rolling temperature of Fe rich in O should be around 800° C. 19. O lowers the mechanical properties of Fe and steel. This is particularly true when the amount of O in low C steel reaches 0.05% or more. A. I. Krynitsky (25)-B-

Discontinuities in Adsorption Isotherms. ARTHUR F. BENTON & T. A. WHITE. *Journal American Chemical Society*, Vol. 53, Sept. 1931, pages 3301-3314.

In a study of the adsorption of gases by Ni, Cu and Fe, a considerable number of new examples of discontinuous isotherms have been found. The effects of temperature, poisons and heat treatment of the adsorbent on the discontinuities have been investigated. A new hypothesis of physical adsorption is proposed, according to which the observed steps represent the formation of concentric rows of adsorbed molecules, first at the edges of each crystal face, and building up successively toward the center. The hypothesis is shown to be supported by the known facts. The mechanism of adsorption in rows offers no difficulty if it is assumed that neighboring adsorbed molecules evaporate from the surface less readily than isolated molecules, and that physically adsorbed molecules posses mobility in the plane of the surface. MEH (25)

The Degasification of Cast Copper by Lithium. (Die Entgasung von Kupferguss durch Lithium.) A. BURKHARDT & G. SACHS. *Metallwirtschaft*, Vol. 11, Apr. 22, 1932, pages 239-242.

8 references. Cu cathode scrap was melted in graphite crucibles and small percentages of Li, P, Be, Ca, Si, Mg and Al were added shortly before pouring to deoxidize the metal. The electrical conductivity, density, tensile strength and elongation of the sand cast rods and conductivity of wire drawn from the rods were determined. All additions have a similar effect on the cast bars, small percentages improving all the properties. With bigger additions the conductivity is reduced while the other properties are not changed much. In wire form the conductivity is slightly increased by small additions and drops with bigger additions. Li is exceptional in its effect on the conductivity of both cast Cu and Cu wire. As little as .005 to .01% Li in Cu wire increases the conductivity 20% above that of the original material. Li and Be are especially suitable for deoxidizing Cu as an excess over the optimum amount is not harmful. With P an excess reduces the conductivity considerably and it should not be used. CEM (25)

The Effect of Pressure on the Liberation of Gases from Metals. (With Special Reference to Silver and Oxygen.) N. P. ALLEN. *Institute of Metals, Advance Copy* No. 604, Sept. 1932, 24 pages.

2 arrest points were observed in Ag melted in air. The second arrest was due to the liberation of O, as proved by visual observation during freezing. Ag melts containing various amounts of O were prepared by melting under several partial pressures of O. As the O content increased the higher arrest point was lowered while the lower one remained at a constant temperature, as in eutectiferous alloys. Ag containing O was frozen under pressure in an autoclave. As the pressure (of N or O) increased to 2 or 3 atmospheres the density of the ingots increased to a constant value. The significance of the results are discussed in some detail and a 3-dimensional diagram of the Ag-O system is presented. A method for eliminating blow holes in cast metals by solidifying under pressure is recommended. Melting Ag in contact with O in a bomb proved that at sufficiently high pressures a Ag-Ag oxide eutectic similar in appearance to the Cu-Cu_2O eutectic is formed. The "internal gas pressure" in solidifying tough-pitch Cu was calculated from thermochemical data. This pressure was found to be about 92 atmospheres. JLG (25)

The Effect of the Treatment of the Melt on the Gas Content and Shrinkage of White and Gray Cast Iron. (Einfluss der Schmelzbehandlung auf den Gasgehalt und die Schwindung von weissem und grauem Gusseisen.) P. BARDENHEUER & W. BOTTENBERG. *Die Giesserei*, Vol. 19, May 27, 1932, pages 201-206. See *Metals & Alloys*, Vol. 2, Dec. 1931, page 320. Ha (25)

INSPECTION (26)

Small High-Duty Pipe Testing Presses. *Hydraulik Review*, Vol. 2, No. 2, 1932, pages 9-11.

An automatic machine is described which tests in a routine way small pipes of about ⅜" diameter and from 4" to 20" in length by compressed air. Ha (26)

Applies Electric Gage to Continuous Inspection of Strips and Sheets. *Iron Age*, Vol. 129, Feb. 18, 1932, page 453.

Describes the application of the electro-limit gage made by Pratt & Whitney Co. for measuring the size of strip sheet, stock wire, foil, etc. The only electric power needed to operate the device is a 110 volt 60 cycle source. VSP (26)

Method of Copying the Profile of Rough Surfaces. (Eine Methode zur Darstellung der Profilkurven rauher Oberflächen.) G. SCHMALTZ. *Die Naturwissenschaften*, Vol. 29, Apr. 29, 1932, pages 315-316.

Deals with microscopic investigations of rough surfaces, for instance of machined metals, wood, paper, minerals, etc. Due to a special illumination device arranged perpendicular to the inspected profile, the latter is illuminated through small slit. Under an acute angle a photograph can be taken and the entire surface can be tested by gradually shifting the illumination beam. EF (26)

Results of Tests Made in France on Long Distance Telephone Cables Recently Placed in Service. (Résultats Obtenus en France sur les Câbles Téléphoniques à Longue Distance Mis Récemment en Service.) J. REYVAL. *Revue Generale de l'Electricite*, Vol. 31, June 4, 1932, pages 775-779.

Gives the results obtained recently of tests made to measure the effectiveness of cables by determining their quality. The kind of cable and the nature of the conditions to which they were exposed were taken into consideration. The cable tested was 80 kilometers long. The results are given in curves and tables. MAB (26)

Phonograph Pickup and Amplifier Used to Test Small Bearings. *Steel*, Vol. 90, Mar. 28, 1932, page 39.

A device for the rapid testing of small ball bearing assemblies. This consists of a 1/6 H.P. motor, a phonograph needle, a radio phonograph pickup, 2 stages of amplification, a standard loudspeaker and an indicating milliammeter. The needle bears down on the outer race of the bearing as it rotates. Defective bearings are recognized at once by high-pitched noises and excessive currents in the loudspeaker circuit. JN (26)

Testing Method for Welded Constructions. (Prüfverfahren für geschweisste Konstruktionen.) H. SCHMUCKLER. *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, June 26, 1932, page 343.

A simple and inexpensive method for testing welds is described. By milling the weld seam and etching the quality can be studied. The apparatus, driven by an electric motor, is equipped with a special type miller driven through a flexible shaft. The seam is not destroyed in the test. The apparatus has been adopted by the German Federal Railway. GN (26)

Inspection of Metals. (I) & (II). A. A. ROBERTSON. *Chemical Engineering & Mining Review*, Vol. 24, May 5, 1932, pages 267-273; June 6, 1932, pages 307-311.

A discussion of metallurgical testing. Inspection tests available are: (1) analysis, (2) mechanical tests, (3) non-destructive special tests, and (4) metallographic tests. Emphasis is given to the non-destructive tests. Metallographic etching tests are classified as: deep etch, pickling etch, macro etch, and S-print. Various solutions employed for these tests are described. Tables indicate some hardness tests and hardness machines, metallographic etching tests, reagents for deep etching, and solutions for etching steel. WHB (26)

Photography of the Inside of Tubes. Detection of Defects. (Rohre werden innen photographiert. Materialfehler werden auf dem Film entdeckt.) K. L. WEBER. *Die Umschau*, Vol. 36, Jan. 16, 1932, pages 50-52.

A camera is described for taking snapshots of the inner wall of tubes down to 7.5 cm. inside diameter. The various features of this inspection equipment, which operates entirely automatically, can be taken from several illustrations accompanying the paper. 8 photographs reveal the degree of machining and the defects of tubular bodies. Using a film a complete survey of the inside is secured. EF (26)

EFFECTS OF ELEMENTS ON METALS & ALLOYS (27)

Effect of Certain Alloying Elements on Structure and Hardness of Aluminum Bronze. SELMA F. HERMANN & FRANK T. SISCO. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 93, 1931, pages 262-283.
Includes discussion. See *Metals & Alloys,* Vol. 2, Jan. 1931, page 18. (27)

Studies on the Influence of Oxygen and Sulphur on the Forging Qualities, Red Shortness and Other Properties of Pure Iron. (Untersuchungen über den Einfluss von Sauerstoff und Schwefel auf die Schmiedbarkeit, Rotbrüchkeit und andere Eigenschaften des reinen Eisens.) ERIC W. FELL. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule Aachen,* Vol. 11, 1932, 8 pages.
See *Metals & Alloys,* Vol. 2, Aug. 1931, page 153. Ha (27)

Vanadium in High-Speed Steels. A. B. KINZEL & C. O. BURGESS. *Iron & Coal Trades Review,* Vol. 124, Mar. 18, 1932, pages 480-481.
See *Metals & Alloys,* Vol. 2, Aug. 1932, page MA 257. Ha (27)

The Influence of Phosphorus on Copper-Tin Bronzes. (Die Kupfer-Zinnbronzen und deren Beeinflussung durch Phosphor.) G. KREBS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 10, 1932, pages 281-282.
Discussion of the mechanical properties of bronzes and the effect of various contents of P on the properties. The tensile strength and toughness is nearly double that of common bronze. The good corrosion resistant properties of P bronzes are pointed out. GN (27)

Addition of Vanadium Improves Properties of Medium Manganese Steel. W. C. HAMILTON. *Iron Age,* Vol. 129, Mar. 3, 1932, pages 546-548.
Intermediate Mn steel often shows decided segregation, and if Mn is excessive, this segregation results in formation of martensite when steel is cooled rapidly in air. It is important to maintain proper ratio between C and Mn in order to obtain uniformity in microstructure and therefore uniformity in physical results. Another undesirable factor is due to tendency for excessive grain growth. Addition of about 0.10% V to this intermediate Mn steel produces marked improvement in microstructure and physical properties. Grain growth is retarded and V addition makes possible a different ratio between C and Mn which results in a steel with superior physical properties and without segregation. With same normalizing treatment the structure of the Mn-V steel is sorbitic rather than pearlitic. This steel is known as Hylastic V steel by the American Steel Foundries. VSP (27)

Precipitation Hardening of Steels with 18% Cr and 8% Ni Through Addition of Beryllium, Boron or Titanium and Their Effect on the Corrosion Resistance. (Ausscheidungshärtung der Stähle mit 18% Cr und 8% Ni durch Zusatz von Beryllium, Bor oder Titan und Ihr Einfluss auf die Korrosions-beständigkeit.) HUBERT BENNEK & PAUL SCHAFMEISTER. *Archiv für das Eisenhüttenwesen,* Vol. 5, June 1932, pages 615-620.
The uniform austenitic structure of 18% Cr-8% Ni steel was changed by additions of Be, Ti, or B, in amounts sufficient to cause hardening. The basic structure of the hardened alloys may be that of ferrite or austenite, or a mixture of both, depending on the alloying elements. In addition precipitating compounds and, at times, the compounds existing in the quenched condition, make their appearance. The remarkable change in hardening temperature of Be steel containing varying amounts of Ni may be explained by the appearance of 2 hardening reactions or processes, the α- and γ-solid solutions enabling these processes to take place. As a result of inappreciable stability of the α-solid solution, the hardening process begins even after short annealing at a rather low temperature (500° C.), while the more stable austenite requires increased annealing temperature (700° C.) or a longer tempering period at 500° C. The rise in hardening of austenitic alloys apparently follows a hardening process, which itself results only after a decomposition of the austenite into α-Fe. The high toughness of corrosion-resistant Cr-Ni-steel is considerably decreased by addition of Be, B, or Ti, even in the tempered or improved condition. In the completely hardened state these steels may be said to be even very brittle. Therefore the best suited temper for practical purposes is one giving an average amount of hardness. Furthermore, the good corrosion-resistance of pure Cr-Ni-steel is not attained with the alloyed hardened steels. 15 diagrams and 2 tables of test data on mechanical properties and corrosion resistance. DTR (27)

The Effect of Different Elements on the Annealing and Grain-Growth Characteristics of Alpha Brass. MAURICE COOK & HERBERT J. MILLER. *Institute of Metals, Advance Copy* No. 609, Sept. 1932, 15 pages.
The brass contained 70% Cu, 30% Zn and varying amounts of the following materials: Fe, P, Mn, Al plus Ni and Al plus Si. Sheets 0.125" thick that had been cold rolled to a reduction of 50% were annealed for ½-hr. periods. The annealing characteristics were determined by diamond pyramid hardness values and grain counts. In 70-30 brass, as in most metals, smooth curves result when the hardness is plotted against the annealing temperature. In brass containing any of the added elements mentioned above the curve differed in that after the first marked decrease in hardness the rate of decrease in hardness became negligible and then reached the rate normal for pure brass. The grain size did not increase as rapidly in the special brasses as in the normal brass. Tensile strength values paralleled the hardness values. Added elements also increased the initial softening temperature of the brass. It is suggested that the peculiar shape of the softening curves may be due to precipitation phenomena. 10 references. JLG (27)

On the Influence of the Alloying Elements Nickel, Silicon, Aluminum and Phosphorus on the Solubility of Carbon in Liquid and Solid Iron. (Ueber den Einfluss der Legierungselemente Nickel, Silizium, Aluminium und Phosphor auf die Löslichkeit des Kohlenstoffs im flüssigen und festen Eisen.) E. SÖHNCHNEN & E. PIWOWARSKY. *Mitteilungen aus dem Giessereiinstitut der technischen Hochschule Aachen,* Vol. 2, Oct. 1931, 11 pages.
See *Metals & Alloys,* Vol. 3, July 1932, page MA 226. Ha (27)

INSTRUMENTS & CONTROLLERS (28)

Photo-Electric Tubes Used in Making Automobile Valves. F. L. PRENTISS. *Iron Age,* Vol. 129, Feb. 11, 1932, pages 381-384.
Use of photo-electric tubes for controlling operations is an outstanding feature of the plant of Thompson Products, Inc. Photo-electric tubes are used for controlling the temperature to which tips of valves are heat treated. Electronic control is used also on gathering machines in forge shop. VSP (28)

Automatic Control of Open-Hearth Furnaces. W. TRINKS. *Blast Furnace & Steel Plant,* Vol. 20, Feb. 1932, pages 179-183.
Paper presented at Open-Hearth Conference, American Institute of Mining & Metallurgical Engineers. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 82. MS (28)

Operating Time Meter "Geatim." (Betriebszeitzähler "Geatim.") O. POLLOK. *AEG Mitteilungen,* July 1932, pages 257-258.
This apparatus is essentially a synchronous clock in connection with a counter which indicates the actual operating time of motors, machines, etc. Wiring diagrams for various purposes are shown. Ha (28)

A New Apparatus for Measuring the Heat Expansion of Refractories in the Temperature Range Between 0°-1700°C. (Eine neue Apparatur zur Messung der Wärmeausdehnung feuerfester Stoffe im Temperaturbereich 0°-1700°C.) H. REICH. *Berichte der deutschen keramischen Gesellschaft,* Vol. 13, Apr. 1932, pages 157-166.
The apparatus described works along the principle of measuring the heat expansion by means of a mechanical-optical enlargement. The heat expansion is enlarged by a lever system in the 3 ratios: 1:20, 3:40, 1:10. The measurement is optical. The apparatus permits making accurate determinations of the heat expansion at temperatures up to 1700° C. Actual tests show that the results can be reproduced. The practical results of measurements on 2 silica bricks show the practicability of the new apparatus which is built by Hilby and Schroer, Bergisch-Gladbach, Germany. GN (28)

Temperature and Pressure Control Equipment. *Product Engineering,* Vol. 3, Aug. 1932, pages 334-336.
The operation and application to industrial processes and the points to consider in the layout of an installation are discussed. Ha (28)

Photo-Electric Relay Operates Shear for Cutting Hot Bars at Bethlehem Steel Plant. *Blast Furnace & Steel Plant,* Vol. 20, Feb. 1932, page 183.
Device has been installed at the Lebanon Plant for cutting bars to hot-bed lengths of approximately 150 ft. Enough light is emitted from the front end of the bar as it passes beneath the photo-electric tube to increase the current flowing through it and thus actuate the relay. The change in current is amplified by a Photron tube. Rendleman flying shears and kick-off mechanism are operated by a suitable arrangement of the relay, magnetic contactors, solenoid, induction-type time-element overload relay, magnetic clutch and limit switches. MS (28)

Nickel-Iron Alloys in Temperature Control. *Nickel Bulletin,* Vol. 5, May 1932, pages 105-106.
Thermostatic control by a switch moved by the heating of a bi-metallic strip one of which consists of a Ni-Fe alloy with 36% Ni which has a practically negligible coefficient of thermal expansion up to about 200° C. A few thermostats are described. Ha (28)

Some Notes on the Application of Direct Acting Thermostats to Industrial Appliances. *Gas World,* Industrial Gas Supplement, Vol. 96, Mar. 19, 1932, pages 17-18.
Deals with the advantage in having automatic temperature control for the various industrial processes with thermostatic control applied at very low cost. The particular applications referred to are its use in the hardening of Al (where the action of the thermostat is steady and will turn off the gas before the highest temperature needed is reached), in the drying of cores in Fe foundries, and in washing machines for finished castings where the hot water swilling used in a plating shop is regulated. MAB (28)

"Henderson" Safe-Load Indicator for Cranes. *Iron & Coal Trades Review,* Vol. 125, July 1, 1932, page 9.
In order to prevent overloading of cranes an indicating instrument operated by the hoist-rope deflecting roller is arranged in plain view of the crane operator. Visible and audible warning is given in case of overloading. Ha (28)

Control of Turbine Compressors Applied to Bessemer Converters. A. P. MANSFIELD. *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, pages 259-261.
Three 25-ton converters with individual steam turbine-driven centrifugal air-compressors have been installed recently at McKeesport, Pa. Each compressor is a 3-stage unit with a capacity of 38,000 ft.³/min., and when delivering air at 30 lb. pressure operates at approximately 4800 r.p.m. Outstanding feature of the installation is the pressure governor with its remote control mechanism whereby operation is controlled entirely by the operator in the converter pulpit about 500 ft. away. MS (28)

Control of Blast Furnace Charging Equipment by Tilting Cages. (Steuerung von Hochofen-Begichtungsanlagen mit Kippkübeln.) *Elektrotechnische Zeitschrift,* Vol. 53, July 21, 1932, pages 699-700.
The operation of the lever for starting the charging car prepares the control of all other movements, opening and closing of the top, coke-charge, etc., in the proper sequence. Ha (28)

Remote Control of Centrifugal Compressors Applied to Bessemer Converters. A. P. MANSFIELD. *Blast Furnace & Steel Plant,* Vol. 20, Apr. 1932, pages 338-339, 354.
Control equipment consists of 3-pole, single-throw 1200 amp. d.c., solenoid-operated line oil circuit-breaker; primary control comprising 3-pole, single-throw, 1000 amp., line contactors, one for each line with the 3 contacting poles in series; and control panel including instruments, relays, contactors, protective devices, interlocks, etc., used in conjunction with a d.c. motor-operated liquid slip regulator. Converter operator controls volume of air through switches installed in his pulpit. MS (28)

High Pressures and Temperatures for Steam Prime Movers. *Engineering*, Vol. 133, Jan. 1, 1932, pages 27-28.

Summary of paper by O. Wiberg presented before the International Congress for General Mechanics at Liege. See *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 258. LFM (29)

Creep Tests on High Test Electric Cast Steel. (Untersuchung hochwertigen Elektrostahlgusses durch Dauerstandversuche.) *B B C Nachrichten*, Vol. 19, Jan./Feb. 1932, page 18.

A brief account of creep tests on 15 heats of electric cast steel, alloyed with Mn, Cr, Cr-Ni and Mo in the annealed state. The creep limit was determined according to the abbreviated Pomp method. At 400° and 500° C. the values of the creep limit vary widely in dependence on the alloying constituents, at 600° C. the values decreased so much for all of the steels that the differences due to the alloying components are practically within the limit of accuracy of the tests. Also in dependence on the temperature the creep limits of the various heats vary extensively, for instance, the heat proving best at 400° C. need not be the best at 600° C. and vice versa. The maximum values of creep limit within the series of 15 heats amounted to: 42,700 lbs./in.^{2} at 400° C. 18,500 lbs./in.^{2} at 500° C. and 5,700 lbs./in.^{2} at 600° C. At high temperatures Mo alone offers good creep properties. Its effect can be still further increased by Cr and Cr-Ni. It was possible to improve the creep properties of a common straight carbon cast steel at temperatures of from 400° to 600° C. by 257%. The creep limit at a certain temperature is in a certain relation to the normal tensile strength. GN (29)

Tensile Properties of Steel Castings at Low Temperatures. (Festigkeitseigenschaften von Stahlguss bei Tiefen Temperaturen.) Richard Walle. *Stahl und Eisen*, Vol. 52, May 19, 1932, pages 489-490.

Mechanical properties of 2 cast steel samples are given for temperature range +20° to —77° C. Composition of materials tested:

	% C	% Si	% Mn	% P	% S
Stg 45.81	0.23	0.27	0.59	0.013	0.026
Stg 52.81	0.30	0.36	0.64	0.013	0.023

Methyl alcohol and CO_2 were used for low temperature work. Each sample was kept in cooling agent for 40 minutes until uniform cooling was obtained. For each property, 3 to 6 samples were examined, in order to take care of segregation in material, pipes, blow holes, inclusions or other casting defects. Also in some cases even more samples were tested to make certain of the data. The % changes in mechanical properties referred to properties at + 20° C. as unity are given in the table.

Temperature ° C	Upper elastic limit %	Tensile Strength %	Elongation %	Reduction of area %	Notch toughness %
		Stg 45.81			
—20	+ 6.25	+ 7.67	+ 3.28	— 3.84	—26
—60	+19.6	+16.7	+11.5	+11.0	—86
—77	+31.3	+21.2	+23.6	+ 7.68	—92
		Stg 52.81			
—20	+ 3.69	+ 7.55	— 6.38	— 2.7	—35
—60	+15.5	+15.3	—14.7	—22.6	—87
—77	+22.5	+19.9	—29.8	—38.9	—91

It is possible that the opposite behavior of elongation of the 2 cast irons may be due to preliminary heat or other treatment of the metals, although the structure was normal in both cases. Modulus of elasticity for both were equally high and independent of temperature. For notch toughness test a 10 mkg. hammer was used. The notch strength increased rapidly from +20° to —60° C., while below —60° C. the decrease was rather small. At —20° C. for Stg 45.81 it amounted to 5.7 mkg./cm.^{2}, and for Stg 52.81, 4.4mkg./cm.^{2}. DTR (29)

The Tensile Properties of High Quality Steels at Elevated Temperature. (Die Festigkeitseigenschaften hochwertiger Stähle bei Höherer Temperatur.) *Stahlbautechnik*, Supplement to *Montanistische Rundschau*, Vol. 25, July 16, 1932, page 8.

Abstract of a paper in "Mitteilungen der Städtischen Prüfungsanstalt für Baustoffe des Wiener Magistrats," No. 1, 1932. The first part of the paper is given to theoretical considerations on the effect of various alloying elements on the critical temperature limit in creep tests. In the temperature range below this critical temperature every element which does not combine with the matrix but which, due to its presence, hinders the capacity for slip of the crystals, will increase the creep limit. Elements which increase the amount of amorphous cement in the grain boundaries exert the same effect. In the temperature range above the critical temperature every element which increases the amorphous cement increases the creep limit. Elements which raise the strength of the amorphous cement also increase the creep limit. Ni refines the grain and thus increases the creep limit in the temperature range below the critical temperature. For the same reason Ni impairs the creep limit in the temperature range above the critical temperature, Cr, W, V and Mn which favor the formation of carbides increase the creep limit in both temperature ranges since they hinder the flow of material. The following table gives some of the results:

Material	Testing Temperature					
C steel						
Tensile Strength lbs./in.^{2}	20°C. 92450	400°C. 85300	500°C. 61200	600°C. 39800	700°C. 19900	820°C. ....
Proportional Limit lbs./in.^{2}	49800	15600	11400	5000	4300	....
Cr-Ni steel						
Tensile Strength lbs./in.^{2}	76800	.....	56900	31300	14200	7100
Proportional Limit lbs./in.^{2}	37000	.....	19900	12800	3600	1420
Elongation %	38	.....	25	32	52	70

GN (29)

Creep Testing of Carbon and Low Alloy Steels by the Short-time Methods. (Dauerstandfestigkeits Untersuchungen an Kohlenstoff- und niedriglegierten Stählen nach dem Abkürzungsverfahren.) Anton Pomp & Willy Höger. *Mitteilungen Kaiser-Wilhelm Institut für Eisenforschung*, Vol. 14, Report 199, 1932, pages 37-57.

This paper treats of the gradual "creep" of metals under long continued static load. The term "static endurance" seems suitable for use to distinguish the phenomenon from endurance under repeated stress. The first part of the paper is devoted to a thorough search and discussion of the literature. Applicability of a short-time or accelerated method for determining static endurance strength bears considerable weight on the question debated throughout the literature as to the existence of a true value for static endurance strength (creep limit). In this work Pomp and Enders' test method was used with several modifications. The magnitude and time of the initial load as well as the preliminary heating period before start of the test bear considerable weight on the test results. The tests were made on 10 C-steels, 4 low alloy-steels and 1 Cr-Ni-steel, in the form of 20 mm. boiler sheets, 15x30 mm. open hearth steel bars, 18 and 25 mm. diam. low Ni, low Mo, low Mo-Cu, low Cr-Mo steel rods. The values obtained were compared with the elastic limits by the ordinary breaking or rupture test, and an approximately constant ratio was established between the 2 values for C-steels. This ratio varied with temperature. Static loading endurance tests up to 840 hours showed that a rate of elongation of 1×10^{-4}%/hr. would be exceeded with loadings somewhat lower than the static endurance strength, as determined by Pomp and Enders' short-time method. Thus it appears that this accelerated method is practically confirmed for C— and low alloy steels. However, for a Cr-Ni-steel this method is not applicable. The rates of elongation, occurring with loadings in the range of the static endurance strength, for 3 to 6 and 25 to 35 hour periods, check closely with Pomp and Enders' data. On the basis of static endurance tests it may be said that the increase of the total residual elongation between the 40-hour period and the time for reaching the rate of elongation 1×10^{-4}%/hr., a rate that practically may be disregarded, amounts to not more than 0.15%. DTR (29)

X-Ray Studies of the Thermal Expansion of Bismuth Single Crystals. Alexander Goetz & Rudolf C. Hergenrother. *Physical Review*, Vol. 40, May 1932, pages 643-661.

Previous observations of several investigators have shown certain anomalies of Bi at high temperatures of which the thermal expansion is very prominent. In order to decide whether those effects are to be ascribed to changes in the crystal lattice or in the mosaic structure, the "temperature shift of Bragg reflections" has been studied quantitatively between liquid air temperature and the melting point of the metal. A modified Siegbahn method, previously described by Hergenrother, has been used and an arrangement is described which allows the crystal to be maintained during the observation at liquid air temperature, or at any temperature between 20° and 265° C. The shift of Mo $K\alpha$ radiation reflected from the (111) plane of a Bi crystal has been measured for the first to the fifth order at twelve different temperatures and from it α_{11}, the thermal expansion of the crystal along (111), was calculated. These results have been compared with the values of the true specific heat of Bi and a surprisingly high degree of constancy of α/c_p has been found up to a few degrees below the melting point. Between room temperature and the melting point the thermal expansion coefficient is given by:

$$\alpha_{11} = 14.4 \times 10^{-6} [1 + 1.76 \times 10^{-3} (T_{abs} - 298°)]$$

whereas:

$$c_p = 2.84 \times 10^{-2} [1 + 1.76 \times 10^{-3} (T_{abs} - 323°)]$$

The values of the thermal lattice expansion thus obtained are compared with measurements of α_{11} obtained in the usual macroscopic way by several investigators and also with values observed on the same crystal in the laboratories of the authors. The macroscopic values are found to be different from the X-ray values many times more than could possibly be explained by experimental errors, the principal discrepancies being first a much larger value of $d\alpha/dT$ for the lattice expansion, second the absence of a gradual reversible decline of $d\alpha/dT$ at higher temperatures, which decline is typical for the macroscopic crystal. The X-ray shift does not show any indication of a discontinuity in the expansion within the temperature range observed. Hence the allotropic transformation at 75° C. and close to the melting point do not exist in the sense of a change of the lattice spacing. A definite discontinuity has been found however in the macroscopic expansion at 75° C. This must be ascribed to a small but sudden change in a periodicity of a larger parameter than the X-ray wave-lengths. WAT(29)

On the Influence of Temperature on the Elastic Behaviour of Various Wrought Light Metal Alloys. Franz Bollenrath. *Journal Institute of Metals*, Vol. 48, 1932, pages 255-272.

Includes discussion. See *Metals & Alloys*, Vol. 3, Sept. 1932. page MA 283. (29)

The Creep of Materials and Creep Stresses. III, IV. Jas. Cunningham. *The Steam Engineer*, Vol. 1, Apr. 1932, pages 313-315; July 1932, pages 449-450.

General. AHE (29)

Chrome-Tungsten Steel for High Temperature. V. T. Malcolm. *Iron Age*, Vol. 129, Feb. 4, 1932, page 331.

From a paper read before the Hartford section of the American Society for Steel Treating. Ideal alloy steel for high temperature service would show complete resistance to abrasion, corrosion and oxidation. Minimum requirement of steel for such use is the ability to carry loads continuously without appreciable distortion. C steels are not suitable for temperatures over 700° F. Ni-Cr steels may be used up to 900° F.; 18% Cr steels show grain growth above 900° F.; 18 and 8 rustless steels develop intercrystalline brittleness between 900° and 1200° F. Recommends Cr-W for such service. Cr and W strengthen steel below equi-cohesive temperature, assist the work of C and reduce amount of occluded gas, giving finer and denser structure. VSP (29)

Strength of Materials Subjected to Shear at High Temperatures. FRANKLIN L. EVERETT. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 117-134.

The problem of the creep of materials is treated from a new angle; torsion methods of investigating it are being employed instead of the usual tension methods. This method is said to offer greater accuracy in the measurements of creep and provides simplest stress conditions; a uniformly pure shear is produced in a thin tubular specimen submitted to twisting while the usual method employs a solid bar in tension where the shear stress is more complicated. Tests were made at 400°, 450° and 500° C., after the normal physical properties of the test piece had been determined at room temperature. Another advantage of this method is that the effect of temperature fluctuations is negligible in the torsion test whereas the elongation by temperature is serious in the tensile test. The apparatus and methods used are described and the curves showing the relation of temperature-electricity modulus, temperature-ultimate strength and duration of test-shear strain are reproduced. Ha (29)

Flow Characteristics of Special Fe-Ni-Cr Alloys and Some Steels at Elevated Temperatures. H. J. FRENCH, WM. KAHLBAUM & A. A. PETERSON. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Fuels & Steam Power, pages 97-130.

See *Metals & Alloys,* Vol. 1, Oct. 1930, page 789. Ha (29)

Tube Failures in High Pressure Boilers. (Rohrzerstörungen an Hochdruckkesseln.) *Die Wärme,* Vol. 55, Feb. 27, 1932, pages 139-140.

After one year service some tubes of a 40 atm. boiler failed in service while no corrosion was noticed on the same material incorporated in a 15 atm. boiler. The composition of the corrosion products pointed to an overheating of the tube walls resulting in a reaction between H_2 and Fe. EF (29)

Method for Measuring the Coefficient of Heat Conductivity of Metals. (Verfahren zum Messen der Wärmeleitzahl von Metallen.) E. RAISCH. *Forschung (Zeitschrift Technische Mechanik und Thermodynamik)* Vol. 3, July/Aug. 1932, pages 209-211.

An arrangement for the determination of the heat conductivity of metals, developed by the Forschungsheim für Wärmeschutz at München, is described. The method can be used for the temperature range up to 900° C. and metals of various heat conductivities. The accuracy amounts to ± 5%. The following results were obtained on low C steel and a Cr-Ni alloy.

Composition of the sample	Coefficient of heat conductivity in Kcal./m. hr. at a mean temperature of °C.								
	100	200	300	400	500	600	700	800	900
.12% C, .5% Mn, .12% Si, .05% S, P, Cr.	43.0	39.5	36.5	33.0	29.0	25.5	....	....	....
15% Cr. 61% Ni. 20% Fe, 4% Mn.	10.2	10.5	10.8	11.0	11.1	11.3	11.5	12.0	12.5

The values for the C steel at higher temperatures are somewhat lower than some of the data found in the literature. 3 references. GN (29)

The Behavior of Metals at Elevated Temperatures. (Das Verhalten von Metallen bei höheren Temperaturen.) H. STÄGER & H. ZSCHOKKE. *Schweizerische Technische Zeitschrift,* Vol. 29, June 2, 1932, pages 333-342; June 9, 1932, pages 345-354.

This is an extensive investigation on the creep limit of various materials carried out by the research laboratory of the Brown, Boveri Co. The first part of the paper is given to theoretical considerations on the behavior of crystal grains and grain boundaries at elevated temperatures, the effect of alloying elements on the creep limit, the behavior of austenitic steels, effects of heat treatment and structure and external influences, as oxidation. The machine used is described, the tests bars were heated in a salt bath, the extension was recorded automatically. The creep limit is defined as the load at which the velocity of extension of the test bar amounts to .001%/hr. between the 16-33 hr. of the test. The 2nd part of the paper reports the results. 8 cast steels of various composition were tested as received as well as annealed at 400°, 500° and 600° C. The results show that the effect of the various alloying elements is in accord with the theoretical considerations. In comparing the creep limits with short time tensile tests (yield point, tensile strength, elongation and notch toughness were simultaneously determined at room temperature, 400°, 500° and 600° C.) it is found that such tests do not permit drawing conclusions as to the creep limit. 14 steels were tested: Armco iron, straight C steels and alloy steels containing Ni, Cr, Ni-Cr, Cr-Mo, Cr-V, Ni-Cr-W, Cr-Mo-V, and Ni-Cr-Mo-V. These tests were also carried out at 400°, 500° and 600° C. It was found that the creep limit attained high values even at 600° C. but only in alloy steels, the C content of which does not exceed a certain rather low value. In exceeding this value the creep limit is impaired. A high Ni content is not favorable in spite of the austenitic structure. Welded joints were also tested, made by the fusion as well as the electric method. The creep limits were determined for the base steel plate, the weld and the welded joint. At 300° C. the creep limit of the joint is somewhat lower than that of the base plate, but higher than that of the welding material. At 400° C. the creep limit of the electrically welded joint corresponds to that of the base metal. The values of the fusion weld are lower. At 500° the creep limit of the base metal and joint are the same. There finally were determined the creep limits of soft and hard soldered joints. 5 various soft solders and 3 various hard solders were used to make the joints. The soft soldered joints were tested at 20°, 75° and 100° C.; the hard soldered joints at 150°, 200°, 250°, 300° and 350° C. It is stated that the melting point of the solder used is not of prime importance for the creep limit of such joints. GN (29)

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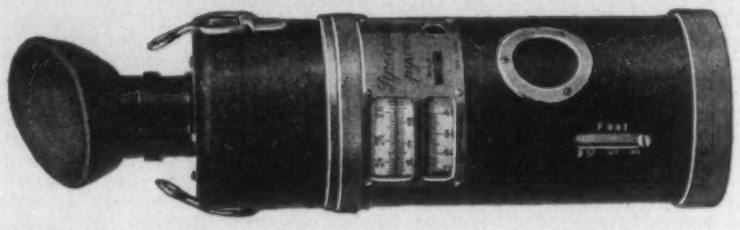

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Elastic Limit at Elevated Temperatures and Creep Strength of Steel. (Warmstreckgrenze und Dauerstandfestigkeit des Stahles.) FRIEDRICH KÖRBER & ANTON POMP. *Stahl und Eisen,* Vol. 52, June 9, 1932, pages 553-559.

The determination of elastic limit under heat, the test method being carried out uniformly, particularly adhering to a definite and a sufficiently extended loading period, gives good check values. Up to temperatures at which testing period gives only slight deviations in results (for straight C steels 300°-350° C., for alloyed steels 350°-450° C.), the elastic limit under heat may be used as a suitable basis for a comparative study of materials and also for the estimation of allowable stresses. The ratio of high temperature yield point to tensile strength at room temperature, for straight C-steels lies within comparatively narrow limits. Thus it is possible to calculate with fair degree of accuracy high temperature yield points from tensile strength at room temperature. With alloyed steels a greater number of tests must first be made to derive the relation of yield point to tensile strength at room temperature, before the latter can be used to calculate yield points at various temperatures. With higher temperatures, due to the progressively increasing importance of the time factor on the elastic limit, more reserve and care must be exercised if the high temperature yield point determinations are to be used to explain the behavior of the material. Under continuous loading exceeding the temperature limits mentioned above, the creep strength only may be used as a measure of properties of the material. On account of the long testing periods requisite for determination of creep, short-time or rapid methods have been developed of late and these rapid methods depend on the determination of rate of elongation in a certain fixed time interval. The authors emphasize the fact that their data show that even slight differences in the short-time test conditions give considerable deviations in the results, and consequently that these short-time tests as developed at the present time are not yet suited or conclusive enough. Data is tabulated showing elastic limit of 2 C-steels and 1 Ni-steel at 20°, 200°, 300°, 350°, 400° and 450° C. Tests made on both 25 mm. round bars or rods and 40 mm.o.d. tubes, 5 mm. thick. Loads applied were maintained 30 sec. for each loading stage. 9 diagrams and 14 references. DTR (29)

Thermal Stresses in Thin-Walled Cylinders. CLARENCE H. KENT. *Transactions American Society of Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 167-180.

A theoretical investigation is offered of the stresses taking place in a cast Fe cylinder with the temperature 100° F. higher inside than outside and under different stress conditions. 29 references. Ha (29)

The Determination of Time-Elongation Limits in the Creep Test. (Die Bestimmung von Zeit-Dehngrenzen im Dauerstandversuch.) E. SIEBEL & M. ULRICH. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, July 2, 1932, pages 659-663.

It has been found that the tensile properties of all metals are dependent under the influence of heat on the time. Even at low temperatures, the elongations due to a certain load do not take place immediately but require a few seconds; at higher temperatures, especially above 300° C., this time lag assumes greater proportions, and so the question arose for a standard in the evaluation of endurance test results and an abbreviated test method. On the strength of experiments it is suggested to use that load, as practical static endurance limit for elongation, at which the elongation velocity for 0.2% permanent elongation has dropped to 1×10^{-4}% per hour. The determination by test of this recommended time-elongation limit can be simplified if the time-elongation curve is assumed to be a parabola. It is then possible to determine, by extrapolation from time-elongation curves taken over at least 50 hours of testing, the elongation velocity for 0.2% permanent elongation. 22 references. Ha (29)

Extreme Temperature Metals. H. W. GILLETT. *Mechanical Engineering,* Vol. 54, Feb. 1932, pages 113-114.

A general survey of the present state as reflected in recent paper on the subject, with special regard to the symposium held in Chicago, June 1931. Alloyed steel, particularly those containing Mo and W, have recently been given preference with nitrided steels following. Ha (29)

LEACHING (30)

The Gold Deposits of Nova Scotia: The Cause of Unprofitable Operations and the Remedy. E. S. ROMILLY SMITH. *Canadian Mining & Metallurgical Bulletin* No. 242, June 1932, pages 308-316.

Only 50% of the Au content of Nova Scotia ores is recovered by amalgamation, the balance is in sulphides. Analyses of concentrates of tailings from 20 mills (after extraction of free Au) shows 21-40% metallic As and $10-$60 of Au. A flow sheet is suggested. AHE (30)

Is the Gold in Tellurides Soluble in Cyanide? H. E. T. HAULTAIN & W. E. JOHNSTON. *Canadian Mining & Metallurgical Bulletin* No. 243, July 1932, pages 349-352.

Cyanide and lime solution dissolved in 48 hrs. over 99% of the Au in the particular telluride treated. AHE (30)

Effect of Adding Common Salt to Cyanide Solutions. A. McA. JOHNSTON. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, Feb. 1932, pages 154-155.

Using 0.5 g. NaCN and 0.1 g. lime in 1000 cc. H_2O and the same + 2.5 g. NaCl, 1000 g. of sand containing 3.30 dwt. Au/ton was extracted with recoveries of 66.6% for the first and 70.9% for the salt solution. Sodium bisulphite + NaCl gave similar results. To 1000 cc. of solution (2.52 dwt. of Au/ton) from the top of the extractor boxes, 25 g. Zn shavings were added for an extraction of 30.5%. When 2.5 g. NaCl was added, extraction was 34.3%. Settlement of slime was very slightly more rapid in salt solutions than fresh. Addition of NaCl to the flux in assaying for Au showed practically no improvement. AHE (30)

REDUCTION METALLURGY (31)

Sintering Tests on Siderite Ore from the Helen Mine, Michipicoten, Ontario. T. W. HARDY & W. S. JENKINS. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 206-210.

A siderite ore assaying Fe 36.8 and S 1.34% sintered but owing to its very fusible nature precautions must be observed to prevent sticking to the pan. About 0.40% S was the lowest S value obtained. Precalcining does not improve either reaction. AHE (31)

Sintering and Sponge Iron Tests on Pyrite Residues. T. W. HARDY & W. S. JENKINS. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 202-206.

The residue from the Freeman process for utilizing pyrite in pulp and acid manufacturing, analyzing Fe 63.00, S 0.65 and insolubles 6.92%, gave a rather weak and brittle sinter, but suitable for blast furnace use. A metallization of 93.5% was secured using city gas. The magnetic concentrate assayed Fe 80.24, metallic Fe 76.20 and S 0.06%. AHE (31)

Innovations in the Roasting of Siderite in Siegerland. (Neuerungen in der Röstung des Spateisensteins im Siegerland.) WILHELM BLUM & HUBERT GLEICHMANN. *Stahl und Eisen,* Vol. 52, June 16, 1932, pages 582-587.

Data are summarized on roasting furnaces with amount of charge, charging time, blowing time, power and fuel consumption, furnace type and dimensions for 15 different units roasting siderite in the German Siegerland. The major economy and improvement in furnace performance and the resultant decrease in fuel consumption was obtained through substitution of forced and induced draft for natural draft, although this requires increased attention in the operation of the furnace. Lower labor costs will result only when complete mechanization has been perfected. Replacement of the scattered fire by indirect heating, which is generally regarded as advantageous, is still in the experimental stage in the Siegerland. Difficulties are met in working up the fine material. Special furnaces are used for roasting the fines in order to get satisfactory results. DTR (31)

Blast Furnace Practice in 1931. GEORGE B. GARRETT. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 54-55.

Operators have been faced with the problem of producing the least possible tonnage on a given furnace and of disposing of surplus gas while keeping cost of production low. Large furnaces are being run at ⅓ to ½ rated capacity by using a constant reduced blast, by carrying full wind for intermittent periods, interspersed with periods when only a few lb. pressure with relatively high blast temperature is carried; by blowing the furnace to capacity during the day and "fanning" during the night; and by banking over the week-end or other periods. Interesting results have been obtained with furnaces running on a burden of 70-100% sinter. Flue dust losses have been reduced by increased diameter of throat and large bell, together with larger downcomer outlet connections. Disintegrators are still favored for final cleaning of gas. An electrical precipitation unit for cleaning gas has been installed during the year. Small, well insulated checker stoves, of high efficiency are being installed. Much attention is being paid to screening of coke. MS (31)

The Blast-Furnace. (Der Hochofen.) E. DIEPSCHLAG. Otto Spamer Verlag, Lepzig, 1932. Paper 7 x 10 inches, 313 pages. Price 25 RM.

The author is professor of metallurgy at the Technical High School, Breslau. The treatise discusses the blast furnace from the point of view of the physical chemistry of everything that goes on inside the furnace.

It is perhaps written from a somewhat more academic standpoint than Johnson's monumental work published in 1918, but covers much the same ground and, of course, includes much important information not available 14 years ago.

It deals with such subjects as rate of reaction of coke and the various factors involved in the choice of coke, temperature distribution and gas composition within the furnace, the properties of various types of ores, the principles of combustion, problems pertaining to the blast, the sizing of the charge and the calculation of charging, the mechanism of reduction and carburization, the metallurgy of furnace operation, behavior of Mn, Si, P and S, and how to produce pig of different kinds, fluxing, slag equilibria and the principles of blast furnace construction and of maintenance of refractories.

A good deal of operating data is given to bring out various points in the discussion, but the treatment is along the line of general principles rather than specific cases.

While some attention is paid to foreign practice and to the work of investigators in other countries, German thought and practice is drawn upon primarily.

It is a useful book, one that blast furnace men will want on their shelves. H. W. Gillett (31)-B-

New Mechanically Charged Blast Furnace. *Metallurgia,* Vol. 6, July 1932, pages 91-93.

Describes furnace recently installed at works of United Steel Companies Ltd. JLG (31)

A Statistical Analysis of Blast-furnace Data. R. S. McCAFFERY & R. G. STEPHENSON. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 60-71.

Includes discussion. See *Metals & Alloys,* Vol. 2, Apr. 1931, page 91. (31)

Air Discharge of Circular Tuyeres. R. S. McCAFFERY & D. E. KRAUSE. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 72-79.

See *Metals & Alloys,* Vol. 2, Apr. 1931, page 91. (31)

Modern Blast Furnace Operation. George W. Tobin. *Blast Furnace & Steel Plant,* Vol. 20, Mar. 1932, pages 257-258; May 1932, pages 420-421.

Deals with features of auxiliary equipment of large-hearth furnaces. Long, wide Fe trough, 22 ft. x 3.5 ft. x 2½ ft., allowing in depth and width for a rowlock lining of brick, has many advantages. Fe runners should be as short as ladle truck clearances will permit. Runner shutters should be large and lifted by means of a cable and counter-weight system from a central lever station. Slag runners should be straight and short, lined with coke braize and sand salvaged from Fe runners. Lining spout noses with clay increases life of castings. Crane in cast house makes possible use of overhead bins for sand and coke braize and a brick-lined pit sunk in the floor for a large clay box. Cast house floor-plan should allow adequate working space, facilitate short haulage of scrap and sand, and permit easy cleaning by sloping floor from runners to wall limits. Best in cast house construction is that which includes sliding side-wall partitions. Flooring should be of brick laid row-locked. Fe plates, with bottoms of cast-in fire-clay brick, and molded with a safety tread surface, should be used for runner crossovers. Basting with a light mixture of loam and water, while castings are hot, will protect mud-gun noses, skimmer gates, Fe runner gates, and upper sections of Fe and slag runners. Common rock-salt is invaluable in cutting down skulls, high bottoms in Fe ladles, and lengthening life of ladle lining. Furnace tools should be stored properly and inspected regularly. A completely automatic electric clay gun has been developed recently. MS (31)

Thermal Efficiency of the Phosphate Blast Furnace. P. H. Royster & J. W. Turrentine. *Industrial & Engineering Chemistry,* Vol. 24, Feb. 1932, pages 223-226.

Although directly pertaining to phosphoric acid production, some guiding principles are presented that may be applied also to reduction metallurgy. MEH (31)

The Theory of Silicate Residues of Blast Furnace Slags. C. D. Abell. *Industrial Chemist,* Vol. 8, Mar. 1932, pages 110-113; Apr. 1932, pages 128-130; May 1932, pages 191-195.

17 references given. The fact that solidified slags are mixtures of 2 or more well defined compounds, principally silicates, is shown by the definite crystalline structure frequently observed and the occurrence of well developed crystals, typical of certain types of natural silicates; the writer calls these "silicate residues." He attempts to correlate their properties and the methods of arriving at an approximate idea of their relative concentration in blast furnace slags, together with a brief account of results from researches at Low Moor. RAW (31)

Factors Controlling the Crystallization of the Graphite in Pig-Irons. Colin D. Abell. *Foundry Trade Journal,* Vol. 46, June 2, 1932, page 341.

The factors controlling the precipitation of graphite in molten pig-Fe are: (a) the critical temperature of the hearth of the furnace, (b) the amount of moisture in the blast, (c) the relative amount of graphite deposited in the shaft zones of the furnace and obtained in the Fe residues of the impregnated-coke phase, (d) the temperature of the core zones and the rate of driving the furnace, (e) the composition of the slag, and (f) the frequency of flushing the slag. The article is intended as an addition to that by Hanemann, abstracted in the *Foundry Trade Journal,* April 7, 1932, page 223. The following factors control the molecular orientation of the C in pig-Fe; the percentage Mn in the Fe, the percentage S in the Fe, the spinel content of the slag. OWE (31)

A Study of High-Manganese Slags in Relation to the Treatment of Low-Grade Manganiferous Ores. C. H. Herty, Jr., J. E. Conley & M. B. Royer. *United States Bureau of Mines, Technical Paper* 523, 1932, 36 pages.

No evidence has been obtained which indicates the possibility of obtaining fluid slags in the region above 60% MnO in the ternary system $MnO-FeO-SiO_2$ without the addition of some fluxing agent. Al_2O_3 and borax appear to be the most satisfactory fluxes for the high-MnO slags, Al_2O_3 being preferable because of economic reasons. Laboratory tests indicate that a satisfactory grade of ferro-Mn may be obtained at about 1550° C. from high MnO slags which have been fluxed with Al_2O_3. AHE (31)

Ferro-Manganese Plant Sestaphoni, Georgia. (Ferromanganwerk Sestaphoni, Georgia.) M. Kauchtschischwili. *Siemens-Zeitschrift,* Vol. 12, May 1932, pages 174-180.

A detailed description is given of a new plant in the Caucasus mountains where the native Mn ores are reduced to ferro-Mn in electric furnaces of 7500 kva. The world production of Mn is reviewed and the advantages of the electric over blast furnace production discussed. Metallurgical calculations of the reduction in the electric furnace are given and the heat balance made up. The consumption per ton of 80% Fe-Mn is about 3500 kwh. at a capacity of 40 t./24 hr. or 14,500 t. yearly. The current density is about 4.2 amp./cm.^{2}, voltage 110 volts; the C electrodes have a diameter of 1100 mm. and carry 40,000 amp.; the power factor is 0.8. Ha (31)

The Reduction of Magnetite and Limonite by Methane. (Die Reduktion von Magnetit und Limonit mit Methan.) Oskar Meyer & W. Eilender. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen,* Vol. 11, 1932, 4 pages.

See *Metals & Alloys,* Vol. 2, July 1931, page 139. Ha (31)

Reduction of Iron Oxide Ores in Molten State by Means of Hydrogen and Other Gases. Samuel L. Madorsky. *Industrial & Engineering Chemistry,* Vol. 23, Jan. 1931, pages 99-103.

By this method of reduction a very pure Fe can be obtained in 1 step from ordinary hematite or magnetic ores. When the slag was made sufficiently basic by the addition of lime to the ore, the resulting Fe was very low in the ordinary impurities. High Ti ore was found to yield Fe containing only a trace of Ti. An estimate shows that by this method very pure Fe can be produced at a cost comparable with that of producing Fe in the blast furnace. MEH (31)

NON-METALLIC COATINGS FOR METALS & ALLOYS (32)

Economic Enamelling for the Gas Industry. *Gas Journal,* Vol. 198, May 25, 1932, page 435.

Describes a booklet put out by Messrs. National Enamels, Ltd., of Norman Road, Greenwich, S. E. 10, England. The pamphlet traces the process of the sheet or plate to be enameled, the preparation of the enamels, the gas-heated furnaces for special temperature control, and the application of the enamels. MAB (32)

Causes of Dirty Spots in Enamel. (Ursachen von Schmutzpunkten in Emails.) H. J. Karmaus. *Sprechsaal für Glas, Keramik, Email,* Vol. 65, June 16, 1932, pages 340-341.

The paper discusses the various causes of impurities in enamels (1) in the raw materials, (2) in grinding, (3) furnace operation, (4) during enameling. 2 references. GN (32)

Fish Scale. (Fischschuppen.) L. Vielhaber. *Emailletechnische Monatsblätter,* Apr. 1932, pages 28-29.

Fish scale on enamels is not caused by admixtures of mica or quartz grains to the enamel but to effects of pressure, particularly gas pressure (hydrogen). It is evident that the pickling process plays an important role in avoiding fish scale. If, despite properly pickling, fish scale appears on the enamel it must be borne in mind that enamels tend to molecular stresses or crystallizations respectively so that pressure is set up. So-called "splash-proof" enamels are secured by the use of suitable feldspar and by a weak burning of the base enamel. GN (32)

Influence of the Chemical Composition on the Enameling Properties of Cast Iron. (Einfluss der chemischen Zusammensetzung auf die Emaillierbarkeit von Gusseisen.) P. Eyer. *Emailletechnische Monatsblätter,* Feb. 1932, page 14.

S is particularly detrimental to the enameling properties of cast Fe in that the segregations of iron sulphide and manganese sulphide render difficult the adherence of the enamel to the surface. The dangerous effect of S can be decreased by a sufficiently high amount of Mn. Too high an amount of P increases the brittleness so that the Fe tends to the formation of cracks on being enameled. The P content should not exceed 0.9%. The Si content should amount to at least 2.2%. With a Si content above 2.6% a coarse separation of graphite and an increased tendency to growing may be apparent. This also may be detrimental to enameling. GN (32)

Testing Pipe Line Coatings in Place. R. J. Kuhn. *Oil & Gas Journal,* Vol. 30, Apr. 21, 1932, page 47; *Gas Age-Record,* Vol. 69, May 7, 1932, pages 568-570, 582.

Paper before the American Gas Association Distribution Conference. The electrical resistance of the coating on a 2500 ft. section of 12" steel pipe at New Orleans, La. was measured in place when first laid and at various times up to 1½ years. 3 months after laying the coating had 1/10 the original resistance and after about 1½ years the value seemed to be stabilized at about 1/20 of the original value. Electrical drainage was used to further protect the pipe. VVK (32)

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New Grinding Method for the Edges of Enameling Grates. (Neues Schleif-Verfahren für Emaillierrostspitzen.) SCHICKHARDT. *Emailletechnische Monatsblätter,* Feb. 1932, pages 11-12.

The maintenance of very fine edges of enameling grates is facilitated by a new handy grinding apparatus. The case is made of light metal; weight about 3 kg. In comparing the work time required for sharpening the points by hand with a file with that required by the new apparatus a considerable saving of time can be achieved. GN (32)

The Enameling of Cast Iron. BERNARD B. KENT. *Foundry Trade Journal,* Vol. 46, Apr. 21, 1932, pages 243-244.

The author, after dealing with the production of frit, discusses the type of casting that can be most easily and successfully enameled. Attention is then directed to the sandblasting of suitable castings, and later to the spraying of the castings so prepared. The operations of drying and of fusing are dealt with in order, the article closing with a discussion of the difficulties which present themselves to the enameler during his work. OWE (32)

The Composition of Enamels. I. Ground Coats for Sheet Steel. LUDWIG STUCKERT. *Ceramic Age,* Vol. 19, May 1932, pages 211-213, 237.

The mechanics of enameling steel and cast-iron are explained and the function of the ground coat discussed. After a review of the theoretical and experimental work in this field it is now an accepted fact that the ground coat serves to create a firmly adhering basis on the metal on which the cover coats can be deposited. Composition, fusing points, physical properties desirable in ground coat enamels, especially heat expansion coefficients, are fully discussed. It is concluded that the good bonding power between ground coat and metal is due to the presence of Co and Ni; the reasons for it seem to be a deposition (electrolytically or chemically) in the firing process. Another view is that an iron oxide film must exist on the metal in order to obtain a firmly adhering coat; but this is not quite fully elucidated. 14 references. Ha (32)

ORE CONCENTRATION (33)

Ore-Concentration Statistics in 1930. Metallurgical Results, Flotation Reagents, and Bibliography. T. H. MILLER & R. L. KIDD. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, Part 1, Sept. 1, 1932, pages 749-791.

Nonferrous metal mines in the U. S. produced 76,725,000 tons of ore in 1930 (106,179,000 tons in 1929) classified as follows: Au and Ag 5.01, Cu 62.14, Cu-Pb 0.46, Pb 10.62, Pb-Zn 13.70, and Zn 8.07%. Of the total, 4.79% was of smelting grade, 4.27% was treated at Au and Ag mills, 5.80% was treated by miscellaneous methods (chiefly leaching), and 85.14% was concentrated. Of the total ore concentrated 5.08% was treated by gravity methods only, 58.93% by flotation and 35.99% by gravity and flotation methods combined. In 1930, as in 1929, pine oils, cresylic acid, and orthotoluidine were the only frothing agents used; 98.65% of the ore was so treated. Of the total collecting reagents used during 1930, 81.92% was of the synthetic group and 18.08% of the distillation group, compared with 71.64 and 28.36%, respectively, in 1929. Several new synthetic reagents were introduced during 1930, including Na dibutyl dithiophosphate and certain xanthate derivatives such as "Minerec." The most important collector was ethyl xanthate. Alkalies were used with 92% of the ores (96% in 1929) in about the same amount per ton as in 1929. Lime is of chief importance. Figures are given for each reagent showing the number of plants using it, the tons of ore treated, and the amount used, total and per ton. Similar data are given for each type of ore. Metallurgical data including ore and concentrate compositions and recoveries are given for most of the classifications. A bibliography of 193 references is included. AHE (33)

Refractoriness. H. A. WHITE. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, Jan. 1932, pages 122-127.

Discussion of paper abstracted in *Metals & Alloys,* Vol. 3, July, 1932, page MA 231. AHE (33)

A Device for Equalizing Dorr Classifier Overflow. A Device for Spreading Pulp. E. T. DUNSTAN. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, Mar. 1932, pages 186-188.

These 2 new devices are described and illustrated. AHE (33)

Experimental Tests on Gold Ore from O'Brien Mine, Cadillac Township, Abitibi County, Quebec. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report,* 724, 1932, pages 69-80.

A Au ore assaying 2.77 oz./ton gave recoveries of 76% by amalgamation alone with grinding to minus 65 mesh, 96% by amalgamation followed by cyanidation of the tailings, 95% by amalgamation and flotation, and 97% by amalgamation, flotation and tabling. Details of 15 tests are given. AHE (33)

Experimental Tests on Gold Ore from the Brookfield Mine of the United Goldfields of Nova Scotia, Ltd., Liverpool, Nova Scotia. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 135-145.

A low grade Au ore assaying 0.21 oz./ton chiefly in arsenopyrite and pyrite and in which 40% of the Au is free was treated by various methods of concentration. Maximum recovery by amalgamation was 52% at minus 100 mesh. Cyanidation recovered 74-86% of the Au with consumption of KCN of ¾ lb./ton and of CaO of 3½ lb. Flotation followed by tabling of the tailings gave 96-97% recovery. Without roasting, 66% of the Au in the concentrates was recovered by amalgamation and 87% by cyanidation. After roasting, amalgamation recovered only 40%; cyanidation 95%, an overall recovery of 91%. AHE (33)

The Recovery of Gold from the Ore of the Casey Mountain Operating Syndicate, Summit Lake, Patricia Portion, Ontario. A. K. ANDERSON. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 150-154.

A magnetiferous quartz carrying Au and small amounts of mispickel, pyrite and traces of galena and chalcopyrite assayed Au 0.72 oz. and Ag 0.11 oz./ton and As 0.42%. Amalgamation gave 82% recovery, flotation 75% and cyanidation 96.5%. AHE (33)

Experimental Tests on Gold Ore from the Central Patricia Mines, Limited, Savant Lake Area, Ontario. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 54-64.

Details of flotation, tabling and cyanide tests on an arsenopyrite-pyrite-pyrrhotite-silica ore containing Au 0.60-0.82 oz./ton are given. Cyanidation gave recoveries of 95-98% but with consumption of KCN of 2-6 lbs. and of CaO of 13-27 lbs./ton of ore. Flotation gave 80-90% recovery increased by tabling of the tailings to 93-97%. AHE (33)

Experimental Tests on Gold Ore from the Siscoe Gold Mines, Ltd., Amos, Quebec. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 158-159.

A free milling Au ore assaying Au 0.53 oz./ton and S 0.44% gave recoveries of 90-93% by amalgamation, with 6-7% more with flotation of the tailings. AHE (33)

Concentration Tests on Ore Sample from Sudbury Offsets, Ltd., Levack, Ontario. G. B. WALKER. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 44-50.

A norite gangue with chalcopyrite and pyrrhotite and assaying Cu 0.78, Ni 2.43, S 26.10 and Fe 24.21% was concentrated by various methods. Tabling followed by flotation gave no marked improvement. Flotation followed by tabling gives high recoveries of values in low-grade concentrates. Flotation in a circuit made alkaline with soda ash has not produced high-grade concentrates. Use of CaO gives high-grade concentrates with fair recovery. Cyanide partially depresses Ni and tends to retard Cu flotation if excessive amounts are used. Ni-Fe flotation can be effected by the use of Na_2S, $CuSO_4$, or H_2SO_4. A powerful promoting reagent such as K xanthate or Reagent No. 323 must be used. AHE (33)

Beneficiation of Iron Ore. CLYDE E. WILLIAMS. *Transactions of the American Institute of Mining & Metallurgical Engineers,* Vol. 95, 1931, pages 45-59.

See *Metals & Alloys,* Vol. 3, Feb. 1932, page MA 52. (33)

Gold Mining and Milling in the United States and Canada; Current Practice and Costs. CHARLES F. JACKSON & JOHN B. KNAEBEL. *United States Bureau of Mines, Bulletin* 363, 1932, 151 pages.

The geology, exploration, development, mining, milling and costs of producing Au are discussed in detail. The factors affecting the choice of milling methods, including character of ore, tonnage, capital available, water supply, commercial affiliations, royalties, location and general economic conditions are considered. Milling methods are described and numerous examples of current practice are given, together with costs. AHE (33)

The Recovery of Copper and Gold from the Ore of the Tashota Gold Mines, Limited, Tashota, Ontario. A. K. ANDERSON. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 122-129.

A chalcopyrite-pyrrhotite ore assayed Cu 1.57%, Au 1.85 oz. and Ag 1.87 oz./ton. Results are given of tests with flotation, tabling, amalgamation and cyanidation in various combinations. All tests indicated easy recovery of 90-95% of the Cu. Due to the presence of free air, flotation alone does not yield maximum recoveries of this metal. A combination of flotation, amalgamation and cyanidation yields maximum recoveries. Due to danger of oxidization of the ore before milling, with passage of Cu to the tailing, and because Cu sulphides are strong cyanicides, a cyanide treatment is not recommended in practice. AHE (33)

Gravity Concentration (33b)

Milling Methods and Costs at the Hillside Fluorspar Mines, Rosiclare, Ill. EDWIN C. REEDER. *United States Bureau of Mines, Information Circular* 6621, May 1932, 20 pages.

A mill feed of fluorspar in calcite and limestone with minor galena and analyzing CaF_2 49.59, $CaCO_3$ 41.78 and SiO_2 6.00% is jigged (Richards) to remove the galena in a concentrate assaying Pb 64.54% and Ag 5.24 oz./ton, or PbS 74.52, CaF_2 12.24, $CaCO_3$ 11.21 and SiO_2 1.52%. The tailings are jigged (Harz) to give a concentrate assaying CaF_2 86.13, $CaCO_3$ 12.58 and SiO_2 0.92%. Undersize material is tabled. Tailings averaging CaF_2 27.15, $CaCO_3$ 64.73 and SiO_2 7.50% are cleaned in a Hancock jig to give final tailings assaying CaF_2 11.06, $CaCO_3$ 72.90, and SiO_2 15.12%. Costs for labor and supplies are $0.542/ton of ore milled. AHE (33b)

Recovering Alluvial Gold. *Engineering & Mining Journal,* Vol. 133, Aug. 1932, page 432.

3 types of Au-saving appliances are illustrated. They are: (1) the cradle or rocker type, where water supply is available, (2) the dry blower, common in Australia, and (3) a dry shaker, where water is scarce. WHB (33b)

Flotation (33c)

Flotation Tests on a Sample of Cyanide Tailings from the Kirkland Lake Gold Mines, Limited, Kirkland Lake, Ontario. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 146-150.

Tailings containing 0.062 oz. Au/ton (associated with pyrite), moisture 23%, H_2O-soluble CaO 0.009% and cyanide a trace were floated with a Au recovery of 62.5% in a concentrate assaying 1.36 oz./ton, largely from the —200 mesh material. AHE (33c)

Starch in the Flotation of Gold Ores. D. N. VEDENSKY & L. H. DUSCHAK. *Engineering & Mining Journal,* Vol. 133, June 1932, pages 334-335.

Soluble starch has been effective as a depressant of certain minerals, the results being especially advantageous where the ratio of concentration is high. Results of experimental work at the 2 mills of the Idaho-Maryland Mines Consolidated, at Grass Valley, Calif. on the effectiveness of soluble starch show that: (1) soluble starch is useful in the flotation of Au ores in California, (2) the useful effects are dependent upon the employment of true soluble starch, (3) an inexpensive method of preparing soluble starch at the plant has been worked out, and (4) true soluble starch may have further applications in flotation. WHB (33c)

Flotation of Gold Ores Offers New Opportunities. MAX W. BOWEN. *Engineering & Mining Journal,* Vol. 133, Aug. 1932, pages 448-449.

A brief discussion is given of the Au ores to which flotation processes are applicable, the types of machinery, the reagents used, and the factors to be considered in designing a flotation plant for treating Au ores. WHB (33c)

The Concentration of Silver in the Ore of the Animikie Mines, Ltd., Port Arthur, Ontario. A. K. ANDERSON. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 90-94.

Proustite in an ore of limestone and calcite gangue carrying a small amount of Fe sulphide gave the ore an assay of Ag 46.0 and Au 0.02 oz./ton. Flotation can be depended on to yield a recovery of 95% of the Ag in a concentrate (refloating of a rougher product) assaying Ag 2000 oz./ton. The circuit was alkaline (5 lbs. soda ash/ton); Aerofloat No. 25 was used at the rate of 0.20 lb./ton. AHE (33c)

Investigations on the Flotation of Cassiterite. (Untersuchungen über die Flotation des Kassiterites.) G. GERTH. *Archiv für Erzbergbau, Erzaufbereitung, Metallhüttenwesen,* Vol. 2, Mar. 1932, pages 1-20.

Report from the Ore Dressing Laboratory of the Mining Academy, Clausthal, Germany. The flotation of oxide minerals is discussed. Artificial mixtures of Sn oxides and quartz and then natural Saxonian Sn ores were floated. In both the natural and artificial Sn ores the gangue is floated from the ore with sodium oleate, provided one succeeds in generating on the gangue an adherent coating of silicic acid gel. The methods of generating such coating have been developed in the investigation and the results of the flotation experiments show that the Sn ore can be separated practically completely from its gangue by using these methods. However, the separation is complete only when quartz and mica are the chief gangue minerals. Since losses up to 50% are common with the mechanical methods used at present for separating Sn from its ores, the newly developed flotation method should take a predominant position in Sn ore dressing. 4 references. GN (33c)

Flotation Tests on Ore Sample from Amulet Mines, Limited, Rouyn, Quebec. G. B. WALKER. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 94-101.

A complex ore of chalcopyrite, sphalerite, and pyrite assaying Cu 3.95 and Zn 20.52% was treated by flotation. Use of Reagent No. 301 in conjunction with thiocarbanilide will effect higher recovery of Cu consistent with concentrate grade than the combination of thiocarbanilide and xanthate. Increased amounts of Aerofloat No. 25 resulted in lower Zn tailings. Na aerofloat effected the highest grade Zn concentrates, an average of 56.63% Zn. Reagent No. 208 gave higher grade Zn concentrate than xanthate. AHE (33c)

Milling Methods and Costs at the Concentrator of the Britannia Mining and Smelting Co., Ltd., Britannia Beach, B.C. A. C. MUNRO & H. A. PEARSE. *United States Bureau of Mines, Information Circular* 6619, May 1932, 24 pages.

The chief Cu mineral in a sulphide replacement ore in chlorite schists is chalcopyrite; minor amounts of chalcocite and bornite are present. A bulk concentrate is produced containing chalcopyrite and pyrite with minor Au and Ag; this is ground and refloated to produce a Cu and a pyrite concentrate and middling which are retreated. A blanket Au-recovery unit is provided between the cells producing Cu concentrate and those producing pyrite concentrate. Reagents are: hydrated lime 1.10, K ethyl xanthate 0.04, Aerofloat No. 25 0.005, and pine oil 0.15 lb./ton of ore. Total Cu recovery is 89.36%, sulphide Cu 90.71%. Total costs (details given) are 17.70 cents/ton. AHE (33c)

Flotation Tests on Ore Sample from Denison Copper Mines, Ltd., Worthington, Ontario. G. B. WALKER. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 50-54.

A chalcopyrite-pyrrhotite-norite ore assaying Cu 1.27, Ni 1.15 and S 5.73% was treated by flotation. In a circuit made alkaline with soda ash, a bulk Cu-Ni concentrate can be obtained with cresylic acid. High Cu recovery is indicated. The addition of 0.10 lb./ton of Aerofloat No. 25 increases Cu and Ni recovery in a lower-grade product. For the flotation of a Ni-Fe product, a H_2O-soluble promoting agent must be used. In a CaO circuit much higher grade Cu concentrates can be produced. The use of cyanide in conjunction with CaO has resulted in the most marked separation obtained. After the Ni-bearing pyrrhotite has been depressed by CaO and cyanide, it is most difficult to float. AHE (33c)

The Concentration of the Copper-Nickel Ore of the Falconbridge Nickel Mines, Ltd., Garson, Ontario. C. S. PARSONS, G. B. WALKER & A. K. ANDERSON. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 29-44.

An ore of sulphides of Cu, Ni and Fe in a basic gangue assaying Cu 1.11 and Ni 2.28% was jigged, concentrated on a Butchart table, concentrated on a Plato table and floated. Gravity concentration gave little improvement. Grinding with soda ash 4.0 lb./ton of ore, flotation of Cu with cresylic acid 0.04 lb. followed by flotation with 0.20 lb. American Cyanamid Reagent No. 404 or 0.20 lb. No. 323 + 0.20 lb. cresylic acid gave recoveries of 99% of the Cu and 95% of the Ni. AHE (33c)

The Concentration of the Cobalt Ores of the Agaunico Cobalt Mines, Limited, Cobalt, Ontario. A. K. ANDERSON & D. S. HALFORD. *Canada Department of Mines, Mines Branch, Report* 724, 1932, pages 80-90.

An ore of cobaltite, smaltite and erythrite in a diabase gangue with small amounts of calcite assaying Co 2.60 and Ni 0.60%, Ag 0.22 and Au 0.02 oz./ton was treated by flotation. Using soda ash 7.0 and Flotagen 0.05 lb./ton in the ball mill and Flotagen 0.10, pine oil 0.25, and $CuSO_4$ 1.0 lb./ton in the flotation machine a concentrate (11.93%) assaying 17.76% Co and containing 83.67% of the Co, a middling (10.16) of 1.54% Co containing 16.18% more of the Co and a tailing (77.91%) assaying 0.33% Co was obtained. Flotation tests were made on samples from various parts of the present plant (using gravity separation) with varying success. AHE (33c)

Milling Methods and Costs at the Pecos Concentrator of the American Metal Co., Tererro, N. Mex. H. D. BEMIS. *United States Bureau of Mines, Information Circular* 6605, May 1932, 23 pages.

A complex Ag- and Au-bearing ore containing, in the order of abundance, the following sulphides: pyrite, sphalerite, galena, chalcopyrite, marmatite, chalcocite, bornite, argentite, and proustite, and a gangue of chiefly mica, quartz, tourmaline and hornblende is treated by flotation. Costs for 1930 in cents/ton of ore, were: superintendence 8.95, grinding 27.16, flotation 22.54, reagents 29.46, tabling 3.82, sampling 2.05, thickening 0.25, H_2O 5.37, filtering 3.75, heating 0.71, tailings disposal 0.08, lighting 0.45, lubrication 0.40, mill clean up 1.80, miscellaneous 0.13, experimental 3.20, laboratory 5.95, royalties 2.93 and total $1.1898. AHE (33c)

Magnetic Separation (33d)

Fe Losses in Magnetic Separation. (Om järnförlusterna vid magnetisk separation.) E. ROTHELIUS. *Jernkontorets Annaler,* Vol. 116, Feb. 1932, pages 62-94.

The following conclusions are drawn as to the effect of screening and sorting material before magnetic separation: (1) Screened material gives the best result on magnetic separators. (2) Sorted material gives better results than unsorted or unscreened ore but somewhat inferior to that which is screened. (3) Sorted magnetite is easily separated on tables. Although the recovery is less complete on magnetic separators mixed grains are more easily separated from the concentrate. Coarser clean concentrates are more easily obtained on tables than on separators. (4) Dispersion materials, such as low boiling petroleum fractions, may sometimes facilitate magnetic separation. HCD (33d)

Magnetic Concentration Methods and Costs of Witherbee, Sherman & Co., Mineville, N. Y. T. F. MYNERS. *United States Bureau of Mines, Information Circular* 6624, June 1932, 27 pages.

The feed is magnetite associated with apatite and gneiss of 2 types—(1) hornblende, biotite and no quartz and (2) no hornblende and biotite and much quartz. In 1930, from ore containing Fe 52.57%, 1 mill gave a concentrate containing 67.49% Fe at a recovery of 95.59% and a cost of $0.437/ton of concentrate. Costs for both mills are $0.394/ton of concentrate. AHE (33d)

New-Type Magnetic Separators for Weak Magnetic Ores and Coals. (Beachtenswertes über neuzeitliche Magnetscheider für schwachmagnetische Erze und Kohlen.) J. F. KESPER. *Kali, Erz und Kohle,* Vol. 29, June 10, 1932, pages 86-87.

Description of new types of magnetic separators recently built in Germany. GN (33d)

Magnetic Separation of Faintly Magnetic Bodies in Falling and Horizontal Throw. (Magnetische Aufbereitung schwachmagnetischer Körper im freien Fall und im horizontalen Wurf.) B. GRANIGG. *Archiv für Erzbergbau, Erzaufbereitung, Metallhüttenwesen,* Vol. 2, Mar. 1932, pages 21-25.

Report from the Mineralogic Institute of the Mining Academy at Leoben, Austria. Magnetic separation of free falling material is discussed; the disadvantages of the Edison separator are mentioned. Magnetic separation of material moving through the magnetic field in an inclined position is considered. A separator in which the material passes the magnetic field in a horizontal throw is described. The new magnetic separator is called a "mushroom" separator due to the shape of the central magnet pole. The separator is to be used for dry as well as wet separation. 4 references. GN (33d)

Crushing (33e)

Designs of Typical Jaw-Crushers. *Crushing & Grinding,* Vol. 1, Mar.-Apr. 1932, pages 131-132.

The history of jaw crushers is traced and line drawings of 11 machines are given. AHE (33e)

The Adsorption of Gold in Tube Mills. H. A. WHITE. *Journal of the Chemical, Metallurgical & Mining Society of South Africa,* Vol. 31, May 1931, pages 294-298.

A series of 6 tables are presented by C. L. Dewar as discussion of the paper abstracted in *Metals & Alloys,* Vol. 3, May 1932, page MA 154. AHE (33e)

The Use of a Composite Grinding Load in Tube Milling on the Witwatersrand. F. WARTENWEILER. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, May 1932, pages 262-282.

Using a mixture of steel balls and ore pebbles (about 1:2) as the grinding medium in tube mills in 3 plants, capacities were increased (15% in 1 plant) over those for straight pebble-mill grinding. A shortage of suitable pebbles made the step necessary. In one plant a more selective grinding and an increase in extraction resulted. Operations at these 3 plants are described and detailed data presented. Liner life is increased about 7% when using the composite load. Cyanide consumption has not been increased by the Fe. Power consumption is increased 15-17%. Milling costs are given and show no overall rise by the use of a composite load. AHE (33e)

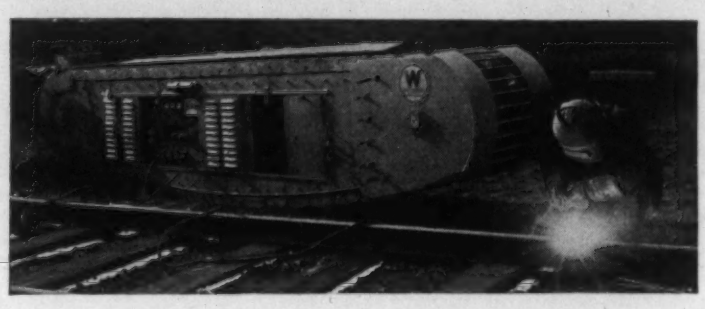
Influence of the Microstructure and of Roasting on the Crushing Properties of Certain Fe Ores. (Mikrostrukturens och rostningens inflytande pa förloppet vid krossning av vissa järnmalmer.) P. J. HOLMQUIST. *Jernkontorets Annaler,* Vol. 116, Mar. 1932, pages 119-148.

The observation that Fe ores are more easily crushed after roasting is explained by the fact that the material breaks along the grain boundaries. Experiments failed to show that roasting facilitated either clean-crushing or a more effective concentration. In quartz-bearing hematites, this was due largely to the distribution of the hematite in fine grains throughout the quartz, and to the recementing of the material during roasting. The grain size curves have the same form for roasted and non-roasted ores, but after roasting the sizes corresponding to the dominating grain sizes in the original ore are much more prevalent, showing that the material breaks up along the grain boundaries. The grain boundaries of crystalline aggregates were found to act as surfaces of weakness during the crushing process. 8 references. HCD (33e)

New Equipment and Materials

Welder for Railroad Maintenance, Etc.

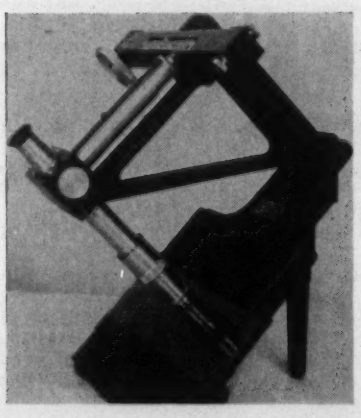
Developed by the Westinghouse Electric & Mfg. Co. to fill the need for a mobile power supply unit which does not require frequent transferring to and from the track for movement from one point to another, a new welder eliminates the use of long cables, does not interfere with traffic, is capable of operating along the shoulder of the track entirely clear of trains, can ascend slopes up to about 35° and is stable in operation on side slopes of 45°. The welding and power unit are self-contained, furnishing welding current for one operator, power for tools and power for propelling the tractor. The moves are made quickly by one man and do not interfere with the right of way. The tractor operator when not moving the tractor is able to do all of the slotting and grinding operations of the newly welded joints. Pivot



turns are possible on any kind of ground, but a platform is usually carried with the tractor for use in crossing tracks and for convenience in making pivot turns. The overall width is 30 in. and the height is 36 in. A bulkhead is built into the rear of tractor frame on which the 2 propulsion motors are mounted. This bulkhead, motors, worm gearing and tread sprockets are removable as one unit, thus facilitating maintenance. A Westinghouse FlexArc welding generator provides welding current for one operator and will handle both bare electrodes at the lower voltages and coated electrodes at higher voltages. Both the welding and auxiliary generator control equipment are mounted on a panel alongside of the unit frame generators. Sliding doors give access to all controls. The gasoline power unit is a Buda, 6-cylinder, 65-h.p. engine. The 2 propulsion motors take their power from the variable voltage, constant current, welding generator.

Metals & Alloys, May 1933.

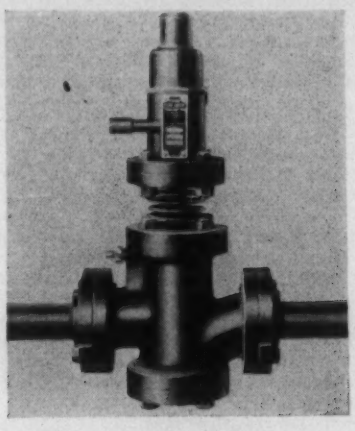
Microdensitometer



This instrument is especially designed for measuring the densities of spectrum lines on photographic plates, and consequently for making quantitative photometric determinations of the intensities of spectrum lines in the visible ultra violet and X-ray regions. It has recently been brought out by the Gaertner Scientific Corp., Chicago. The density of the plate to be measured is compared photometrically with the known density of a neutral absorbing wedge which provides varying amounts of illumination to one part of the photometric field as different integrals of the wedge are used. The wedge and plate are illuminated symmetrically and the 2 resultant beams are compared by means of a photometer cube. Provision is made for compensating for the grain of the photographic plate. The spectrum lines are clearly visible in the field while measurements are made. *The photometric field* is produced in a photometer cube at the focal plane of the eyepiece. A strip 2 mm. wide is silvered on an interior diagonal face of the cube, with the exception of a small central portion 0.1 mm. in width which divides the strip into 2 equal longitudinal parts. The spectrum line to be measured is selected and brought into position midway between the 2 portions of the strip producing a continuous field. The wedge is then manipulated so as to match both sides of the strip with the spectrum line, resulting in a continuous strip of uniform intensity. *The neutral absorbing wedge* is 100 mm. long and its position is indicated by a millimeter scale and index. The variable densities of this wedge are proportional to its displacement on the scale, the range being from 0 to 4. These figures represent the logarithms of the reciprocals of the transmission coefficients of the wedge, thus: the range of transmitted light is from 1 to .0001. Exact matching of the photometric field is possible without defocusing. *The microscopes* transmitting the 2 paths of light to the photometer cube are optically similar, and are fitted with 36 mm. E.F. objectives. The field is viewed through an eyepiece of 25 mm. E.F.L. at a magnification of about 15 diameters. About 5 mm. of the spectrum plate may thus be seen at one time. Adjustable draw tubes permit the use of the instrument in a lighted room.

Metals & Alloys, May 1933.

Remote-Reading Liquid Meter



Complex and costly arrangements usually needed in order to meter heavy oils, chemicals, etc., are not required when installing a new type of fluid meter brought out by The Brown Instrument Co. It consists of two main elements: the meter body and electrical transmitter (illustrated), and the receiving instrument which may be a round-chart recorder, a dial indicator or a combination of these two. The primary element is of the "area" type. It consists essentially of a piston-and-sleeve arrangement whereby a fixed pressure drop is maintained and the position of the piston both regulates the area and corresponds to the quantity-rate of flow. To the piston is fixed a rod, the upper end of which carries the armature of an inductance-bridge transmitter. This armature travels up and down in a non-magnetic tube which separates the fluid meter from the electrical parts without need of stuffing boxes. Sizes (based on water metering) range from 150 g.p.h. capacity to 2000 g.p.h. capacity.

Metals & Alloys, May 1933.

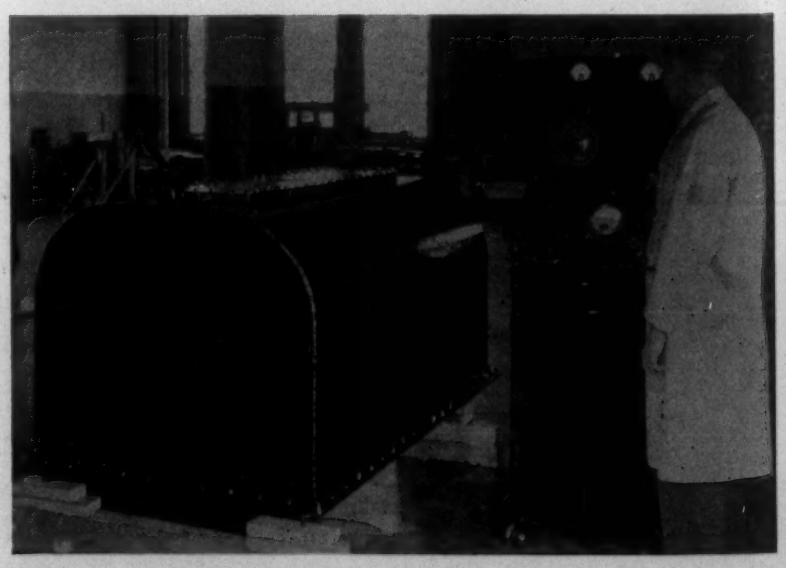
Rubber-lined Valve

Designed for handling corrosive and abrasive fluids, a new rubber-lined valve, the Vulcalock valve, announced by The B. F. Goodrich Rubber Co., Akron, O., may be lined with any of the standard Goodrich Acidseal rubber compounds, hard or soft, depending upon conditions of service. It represents a distinct departure from previous valve design. Its cost is moderate. Its action does not depend upon a flexible diaphragm; the resilient, rounded disk which snaps over a circular plate at the lower end of the stem provides a positive seal when brought into contact with the molded rubber-covered seat. Both disk and ring are simple, inexpensive, easily replaceable parts. A steady, uniform flow with positive shutoff is obtained under severe operating conditions. Corrosive or abrasive materials come in contact only with rubber especially designed to resist their deteriorating action. On sizes up to and including 6 inch, there is no restriction of flow through the seat ring. The valve may be taken apart completely and easily and quickly reassembled without special tools. Disk and seat removed and replaced with especial ease.

Metals & Alloys, May 1933.

Large X-ray Apparatus

The most gigantic task ever assigned to industrial X-ray work is the minute inspection of every inch of 75 miles of steel welds in the penstocks for Hoover Dam. A special shock-proof apparatus rated at 300,000 volts was developed for the job by the General Electric X-Ray Corp., Chicago, Ill. Complete safety in dealing with such high voltages, space limitations, and necessarily easy portability made the



development of the apparatus difficult. Rated at 300,000 volts and 10 milliamps for continuous operation, it is capable of producing radiographs of welded steel plate 4" thick. The high voltage required made the safety factor important. It is impossible for anyone to come in contact with the high-tension system while operating. The apparatus consists of 3 units—a shock-proof head weighing 5,000 lbs., the operator's control unit, and an expansion tank.

Metals & Alloys, May 1933.

Light Gage, High Speed, Precision Flying Shear

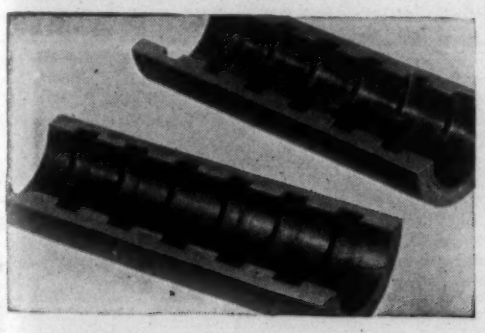
A new high speed precision flying shear for light gage cold strip was developed by United Engineering & Foundry Company, Pittsburgh, Pa. The shear is designed to handle strip up to 36 inches wide from .006 to .025 inches thick into any selected length from 12 to 26 inches in increments of 1/64, and from 26 to 52 inches by increments of 1/32. The action is continuous and fully automatic. It operates at a maximum speed of 300 feet per minute, claimed to be a much higher speed than has been obtained by other flying shears for this type of material. The importance of obtaining each length exactly as desired without error has necessitated the designing of a gear box having a total of 832 changes of speed and eliminates the hazard of frictional and hydraulic contrivances. The change of speed of the gear box to obtain different lengths is quickly effected by moving three levers conveniently located on one side of the gear box. It takes approximately 80 seconds to effect the gear change and not over 20 seconds to change the guides. An ingenious device is applied to the knife operating levers for changing the setting of the knives while operating.
Metals & Alloys, May 1933.

Tantalum Carbide Tools

Announcement has been made by the Ramet Corp. (subsidiary of Fansteel Products Co., North Chicago, Ill.), of the development of a complete line of Ramet tantalum carbide tools for cutting, drawing and working all metals. *Grade A*: For general service in machining cast-iron and non-ferrous materials in which there is edge wear and only a slight tendency towards cratering. *Grade AA*: Similar, but specially designed for intermittent cuts and heavy duty applications involving shock. *Grade B*: For cutting materials requiring combination of resistance to cratering and edge wear such as cast alloys used in crankshafts, etc., steel screw stock with high sulphur and phosphorus content, etc. *Grade C*: In general, for soft steels which have the greatest tendency to cause cratering. *Grade D*: Similar to Grade C but for harder steels and high speed operation. *Grade X*: High resistance to both cratering and edge wear. Suitable for very hard steel (above 450 Brinell) and for manganese steels having 12 to 14% manganese content.

In addition to cutting applications, wire, tubing, and extrusion, dies have been developed from *special grades* of Ramet to give any desired characteristics. Ability to withstand corrosion is pointed out as an advantage in connection with acid dips or washes. Another is the high finish applied to products worked which commands premium prices. In a comparative test, 7000 lbs. of .0114" steel weaving wire was drawn per recutting of Ramet dies against an average of 30 lbs. per recutting of steel dies. Other interesting applications include highly polished and extremely hard friction disks, needle valves, scribers, knife edges for scales, gages, micrometers, spring coiling arbors, and forming tools of various types.
Metals & Alloys, May 1933.

Non-Metallic Bearings



Gatke bearings are now available in a complete line for all general machinery uses, announces the Gatke Corp., Chicago, Ill. Gatke non-metallic bearings are composed of a special textile base impregnated with synthetic resins, molded under high pressures. Gatke Hydrotex bearings are recommended wherever bearings run in water or where water is available for lubrication; Gatke Lubritex bearings are designed for equipment that is oil lubricated; Gatke Grafitex is self-lubricating and especially made for slow moving machinery, where dirt and grit are encountered or where lubrication is neglected. Bearings of all 3 materials are already furnished for journal diameters from ⅛" to 24" and can be made to larger sizes.
Metals & Alloys, May 1933.

Transparent Cup Goggles

Willson Products, Inc., Reading, Pa., point out that "goggle kickers" are in a measure justified in their complaints, because of the usual "blinder" feeling. The cups of the new Willson Goggle are made of a transparent material which enables the wearer to perceive objects through them. The "blinder" feeling is entirely eliminated and the operator obtains a visual comfort heretofore unattainable. No sacrifice of the elements that go into making a good goggle was necessary to obtain cup transparency. The goggle is sturdy, spark-proof, extremely light in weight, roomier, better ventilated, serves well for all-purpose use and can also be worn over spectacles.
Metals & Alloys, May 1933.

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MANUFACTURERS' LITERATURE REVIEWS

93 **Rust Prevention**—For the protection of bright steel goods or parts in transit and export shipments where the danger of corrosion is great, "Croda Fluid" is recommended in a leaflet sent out by Cox, Aspden & Fletcher, New York, N. Y. This coating may be applied by brush, spray or immersion and is furnished in three grades to meet different requirements.

94 **Rezistal**—Several folders issued by the Crucible Steel Company of America, New York, N. Y., illustrate applications of their Rezistal KA-2. This is a high chromium-nickel steel which has been given special processing and heat treatment which make it easy to fabricate. It is particularly recommended for use in dairy equipment and in culinary departments of institutions, and can be used to good effect in architectural design in grille work, metallic doors, window frames, etc.

95 **Forging Machinery**—A recent catalogue of the National Machinery Co., Tiffin, Ohio, contains descriptions of the various types of forging machines manufactured by them in addition to descriptions of bolt, nut, rivet and wire nail machinery.

96 **Chrome Nickel Silver**—A folder issued by the American Nickeloid Co., Peru, Ill., describes their new metal, chromium bonded to a nickel silver base, and it contains a small sample of the material.

97 **Allegheny Metal**—Bulletin A-10 of the Allegheny Steel Co., Brackenridge, Pa., illustrates applications of their Allegheny Metal in the dairy products industry, in building construction and in a great variety of unusual applications. Bulletin A-1 of the same company gives the chemical composition of this metal, its resistance to various media and its physical properties.

98 **Welding Electrodes**—An attractive booklet sent out by the Metal & Thermit Corporation, New York, N. Y., gives a general description of their "Murex" heavy mineral coated electrodes, discusses the advantages experienced in their use and describes the different types of these electrodes. Another pamphlet issued by the same company is devoted to the problem of welding manganese steel by the "Murex" method.

99 **Portable Blow Torch**—A leaflet recently sent out by the North American Manufacturing Co., Cleveland, Ohio, is devoted to their portable blow torches and some of their various applications. This company has also prepared bulletins showing the prices of their oil and air proportioning valves for manual control.

100 **Gas Producer**—A folder issued by R. D. Wood & Company, Philadelphia, Pa., gives a condensed description of their automatic gas producer, type SB. One page contains an interesting set of illustrations showing the various types of gas producers manufactured by the company since 1889.

101 **Molybdenum in Cast Iron**—The 1933 Supplement to their publication, Molybdenum in Cast Iron, has been prepared by the Climax Molybdenum Co., New York, N. Y. It gives a summary of the effect of Mo on gray iron, with and without Ni or Cr, and includes some data from recent literature on the subject.

102 **Properties of Toncan Iron**—A small booklet issued by the Republic Steel Corp., Massillon, Ohio, contains complete data on Toncan Iron, its composition, physical constants, physical properties and heat treatment being given.

103 **How to Make your Own Carboloy Tools**—A 16-page booklet issued by the Carboloy Co., Detroit, Mich., contains a complete description of the method used to mill the shank steel and the braze Carboloy tip to the shank. It also includes data on design and gives a listing of the accessories necessary.

104 **Testing Machines**—Practically all types of testing machines are illustrated and described in Catalog 50 Part H published by the Tinius Olsen Testing Machine Co., Philadelphia, Pa. It includes testing machines for efficiency of cutting or abrasion tools, alternate stress in materials, impact, torsion, cold bend, hardness and for other special purposes. It will be sent free to those requesting it on company letter-heads. To others the price is $1.00.

105 **Microscopes**—A recent pamphlet of Carl Zeiss, Inc., New York, N. Y., is devoted to their binocular microscope the magnification of which can be varied between 4X and 43X. It can be had with various types of stands for different purposes, and its standard equipment includes three pairs of eyepieces and three pairs of objectives.

106 **Electrunite**—This new type of boiler tube, made by electrical resistance welding, may be used in either fire-tube or water-tube boilers requiring straight or bent tubes. They are described in a leaflet sent out by Steel and Tubes, Inc., Cleveland, Ohio.

107 **Zinc Die Castings**—The third issue of The Alloy Pot, published by the New Jersey Zinc Co., New York, N. Y., features an article describing zinc die castings in an inexpensive electric clock. A table showing the impact strength of zinc die castings as compared with sand cast malleable iron and brass is included.

108 **Electric Contact Controller**—Bulletin 184 of the Foxboro Co., Foxboro, Mass., describes their "Rotax," an electrically operated controller with rotating contacts which may be applied to instruments for controlling pressure, temperature, humidity and liquid level.

109 **Boilers**—A folder just sent out by the Titusville Iron Works Co., Titusville, Pa., illustrates various types of their boilers, giving in detail the special features of their "S.R." series.

110 **Furnaces**—A current folder of the Surface Combustion Corp., Toledo, Ohio, gives the operating data of several of their standard furnaces used in a modern heat treating plant, using the batch method of heat treating.

111 **Combating Chemical Corrosion with Aluminum**—A 43-page booklet prepared by the Aluminum Company of America, Pittsburgh, Pa., deals with the use of aluminum in the construction of chemical apparatus and equipment. The effect of different chemical reagents on the metal are considered separately.

112 **Corrosion Resistance**—E. F. Houghton & Co., Philadelphia, Pa., have produced a paint-like finish, "Houghto-Kote," which not only gives protection against rust but also has a high resistance to acid, brine, heat and corrosive fumes and gases. It is made with a gilsonite base and can be had in five colors.

113 **Duroline Pipe**—Cement-lined pipe manufactured by the National Tube Co., Pittsburgh, Pa., is discussed in a 16-page booklet sent out recently. It fills the demand for a product combining the good qualities of iron or steel pipe, exceptional corrosion resistance, and a price permitting its general use.

114 **Simple Testers**—Circular No. 107 of the Amthor Testing Instrument Co., Brooklyn, N. Y., describes a new portable bursting strength tester, new tensile strength testers and a new pocket thickness gage designed for rapid testing of wire, rubber, cordage, etc. Their Circular No. 106 describes their automatic fixed reading tachometer for speed measurement of revolving equipment such as motors, pulley shafts, belt surfaces, etc.

115 **Oil Burner**—A folder issued by the Industrial Combustion Corp., Buffalo, N. Y., discusses the Seil high pressure oil burner with which perfect atomization can be obtained with all grades of fuel oil. It is applicable to such furnace installations as annealing ovens, crucible furnaces, blow torches, forging furnaces, galvanizing furnaces, etc.

116 **"Lectrodryer"**—A recent circular distributed by the Pittsburgh Lectrodryer Corp., Pittsburgh, Pa., is devoted to their new "Activated Alumina System" for drying air and gases. It can be used in controlled atmosphere annealing of deoxidized sheet, dehumidification of warehouses and special process rooms, industrial and chemical processes and gas conditioning.

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Wilson Mechanical Instrument Company	MA 145

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION OF METALS & ALLOYS (4)

Germany Fights Gas Main Corrosion With Tetralin. A. C. Blackall. *Gas Age-Record,* Vol. 70, Sept. 24, 1932, page 317. Tetralin (tetrahydronaphthalene) is a colorless, easily mobile liquid with a specific gravity of 0.9725 at 60° F. and a boiling point of 404° F. It is a hydrogenated naphthalene and possesses the property of dissolving large quantities of naphthalene. At 60° F. 80 parts of tetralin will absorb 20 parts of naphthalene. It will dissolve almost anything of aromatic character but will not dissolve asphalt. It is used in Germany for removing old naphthalene deposits, tar and gummy rust deposits from gas mains and preventing their occurrence. 2 methods are used. In the "cold process" the tetralin is forced through an injector where it is transformed to fog and the individual particles are quickly vaporized by absorbing heat from the gas. In the second method the tetralin is vaporized by means of electric heating units. An installation at a central point is sufficient for the entire system. VVK (4)

The Internal Corrosion of Gas Transmission Lines. A. B. Allyne. *Gas Age-Record,* Vol. 70. Sept. 10, 1932, pages 267-268. Considerable internal corrosion was found in the gas transmission lines of the Southern Counties Gas Co., Los Angeles, Calif., which on investigation resulted in the following conclusions. (1) Oxygen, present only in fractions of a percent in a gas mixture, may cause severe internal corrosion when compressed and sent into a transmission system. (2) This corrosive agent enters the lines chiefly due to leaks in vacuum-collected gathering systems. (3) Due to inaccuracies in ordinary gas analysis equipment, small quantities of oxygen are either disregarded or pass undetected. (Samples were collected in special tanks made of Cu pipe and analyzed in the laboratory using chromous chloride as an absorbent.) (4) To properly prevent serious internal corrosion due to rusting, it is necessary to reduce the oxygen content to 0.2% or less. VVK (4)

A Soil Corrosion Survey With Shepard Soil Resistivity Rods. A. V. Smith. *Gas Age-Record,* Vol. 70, Oct. 15, 1932, pages 403-408. Paper presented before the American Gas Association, Oct. 1932. A soil corrosion survey using Shepard soil resistivity rods was made of 10,000 ft. of a 12" line installed in 1914. Soil resistivity measurements were made every 50 ft. Areas of low resistivity and more particularly areas of low resistivity bounded on both sides by areas of high resistivity showed considerable corrosion. The measurements were also checked by excavations in high resistivity areas and the pipe was found in excellent condition. The rods seemed to indicate corrosive conditions, whether they were due to acid or alkaline soil. They were also useful in locating leaks in areas where the soil resistance was above 5000 ohm-centimeters. Where a gas leak occurs in the soil the resistance of the soil will be lowered to values ranging between 500 and 2000 ohm-centimeters, depending on the time the gas has been leaking. A total of approximately 1300 ft. of main in very bad condition was removed and replaced. VVK (4)

Soil Studies for Existing Pipe-Line Systems. William Thompson Smith. *Gas Age-Record,* Vol. 70, Oct. 8, 1932, pages 369-370, 382, 390. Discussion of the value and procedure for soil studies for pipe-line systems already in the ground. VVK (4)

How Soil Corrosiveness Can Be Measured. William Thompson Smith. *Gas Age-Record,* Vol. 70, Aug. 6, 1932, pages 129-134, 143; Discussion, Oct. 8, 1932, pages 377, 385. A critical review of the methods in use for determining the corrosiveness of soils. These include historical methods, ground moisture determinations, the hydrogen evolution method, total acidity measurements, loss of weight method, the geological method, electrical methods and chemical analysis. VVK (4)

Electrical Methods for Estimating the Corrosiveness of Soils. Scott Ewing. *American Gas Association Monthly,* Vol. 14, Aug. 1932, pages 356-360. Inspections of numerous pipe lines indicate clearly that soils differ greatly in rate at which they attack Fe and steel. Present study was for purpose of learning something about accuracy of various devices for testing corrosiveness. Different methods are described but Columbia soil rod was used for study. This employs one steel and one Cu electrode and galvanic potential between these dissimilar metals constitutes only source of current, no battery being used. A field study was made along pipe lines in Ohio, Indiana and West Virginia. On basis of this experience it was found possible to divide inspection points into 4 classes as follows: (1) Small isolated areas along so-called "sulphur streams" and seepage areas where soil and water contain a high percentage of soluble material. In these pipe usually lasts about 5 years. (2) Low, poorly drained, mucky areas where the pipe life is about 10 years. (3) General typical upland soils of Ohio and Indiana. Pipe as old as 25 years is still in service in these soils, but leaks usually begin after about 15 years. (4) Rough, steep topography in which pipe will last at least 30 years and longer. Readings are plotted from each of these areas showing satisfactory separation. Measurements of galvanic current and of soil resistivity roughly indicated corrosiveness of soils tested but laboratory trials showed that this would not be true for all types of soils. Considerable detail is given regarding tests conducted and results found. RJC (4)

Protective Films on Metals. E. S. Hedges. D. Van Nostrand, New York, 1932. Cloth, 5¾×8¾ inches, 276 pages. Price $5.00. This is a large correlated abstract in book form, which shows the state of the art in very concise and useful form. It does not attempt to include an exhaustive bibliography, but it does skim the cream of the recent important articles.

The mechanism of corrosion is discussed in relation to the effect of films, film formation in the atmosphere and in liquid media, electrolytic films, oxide films from the practical point of view, hot dipping, electroplating, metal spraying, so-called "cementation" (sherardising, chromising, and calorising), etc. are covered. A very brief appendix relates to paints, lacquers, enamels, etc. but these are only casually mentioned. The book is one of a series of monographs on applied chemistry, edited by E. H. Tripp. The point of view throughout is that of the chemist, which is decidedly as it should be. The book will be much used by those concerned with corrosion problems or with the development of alloys or coatings for corrosion and tarnish resistance. Its value lies not merely in the convenience of a collection of excerpts from the literature, but also in the thoughtful and thought-provoking way in which the facts and theories have been put together to form as complete a picture as can be drawn today. HWG (4)-B-

Cases of Incrustation and Destruction in the Pipe System of the Schwenningen Water Supply System. (Verkrustungs- und Zerstörungserscheinungen im Leitungsnetz der Schwenningen Wasserversorgung.) K. Herrmann. *Gas und Wasserfach,* Vol. 75, Nov. 5, 1932, pages 890-893. Interesting cases of corrosion caused by a certain type of alga are described. Incrustation was accelerated by defects and injuries of asphalt coating of the pipes. GN (4)

Protection of Iron Immersed in Aerated Salt Solutions by Cathodic Polarization. (Protection, par polarisation cathodique, du fer plongé dans les solutions salines aérées.) E. Herzog & G. Chaudron. *Comptes Rendus,* Vol. 193, Oct. 12, 1931, pages 587-589. Using an Evans cell to which salts of Zn, Pb, Ni, Mn, Mg, and Cr were added, the polarized cathode, on which oxides of metals are deposited, becomes more electro-negative and assumes a potential near that of the active anode. Except for Pb, the potentials of the anode remain almost the same. It is concluded that the Fe will not be protected by PbO, nor when the Fe has a high Cr content. OWE (4)

Pipe-Line Protection. Stanley Gill. *Industrial & Engineering Chemistry,* Vol. 25, Jan. 1933, pages 49-53. Information and performance of several classes of coatings are discussed under headings: requirements for satisfactory pipe-line coatings, oil paints, bituminous "cut-backs," asphalt emulsions, greases, lacquers and synthetic resins, molten bitumens, pipe-line wrappers, bituminous mastics, cement coatings and vitreous enamels. MEH (4)

SEA WATER CANNOT CORRODE

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For three hundred and seventy-one days samples of ten different alloys all presumably corrosion resistant, were left in wooden trays on the seashore of Burgess Isle, Bokeelia, Florida, so that they were periodically covered by tide water and subsequently exposed to the sun and air. This periodic immersion in sea water and subsequent exposure to the atmosphere is a severe service for any material, as is clearly indicated by the appearance of the ten samples in the unretouched photographs. Below the photograph of each sample tested is its loss in weight in milligrams per square centimeter for the entire period of the test (over one year).

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with a loss of only 1.8 mg. per sq. cm. per year, and without a visible sign of corrosion. The other alloys, and their respective positions in the series of photographs are:

2. 18-8 Stainless Steel
3. High Nickel, Chromium, Silicon, Iron Alloy
4. Chromium, Nickel, Copper, Molybdenum Stainless Steel
5. Nickel (58%), Molybdenum, Iron, Manganese Alloy
6. 14% Chromium Stainless Steel
7. 18-8 Stainless Steel
8. 14% Chromium Stainless Steel
9. Phosphor Bronze
10. Copper, Nickel, Tin, Silicon Alloy.

In sea water or in acids, under any condition of severe corrosion, Burgess-Parr Illium leads the field in resistivity.

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You know what Corrosion does

You have seen plenty evidence of what corrosion of one kind or another has done. It has destroyed metals, equipment, and machinery. It has run up maintenance expenses, delayed production, added gray hairs to the Production Manager's head, caused mechanical failure at crucial moments, and added a world of troubles to a pack already filled.

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Notes on a Distribution System Soil Survey. A. B. Allyne. *Gas Age-Record*, Vol. 70, Aug. 27, 1932, pages 207-208, 219. A soil survey of the entire transmission and distribution system of the Southern Counties Gas Co., Los Angeles, Calif., was started about one year ago (*Metals & Alloys*, Vol. 3 July 1932, page MA 201) and is now 85% completed. The results to date have permitted the tentative classification of soils into certain groups of relative corrosivity and the specification of mains and services for these soils. This classification follows:

	Class of Soil	Descriptive Terms	Rod Readings Ohms-Cms.	Estimated Life of Bare Steel Pipe. Years	Specifications for Mains	Specifications for Service
1	1	Excellent	10,000-6,000	25 or more	Steel pipe with no protective coating.	Steel-wrapped.
2	2	Good	6,000-4,500	17-25	Steel with a protective coating, the cost of which will not constitute more than 10% of the entire cost of the job.	Steel-wrapped.
	3	Fair	4,500-2,000	10-17	Cast Fe, Cu, or heavily protected steel, depending on local conditions. If steel, cost of protective coating shall not exceed 20% of the entire cost of the job.	Cu tubing with soldered couplings and stream-line fittings.
3	4	Bad	0-2,000	0-10	Cast Fe or Cu. No steel installed in this classification of soil.	Same as Class 3.

Shepard soil rods were used. Of the many inspections of pipe and coatings made by this company since the use of the rods, none has been found at which the Shepard readings were below 2000, that the pipe and the coating itself were not in a state of deterioration. To determine the seasonal change in rod readings 149 test locations have been selected at which readings will be taken once a month for a year. The total cost of the survey will be approximately $4000 with 20,000 readings on record. VVK (4)

4 **Formation of Impurities in Municipal Gas Lines and their Effect on the Corrosion of such Systems. (Nachträgliche Bildung von Verunreinigungen im Stadtgase und ihre Folgen auf das Rohrnetz.)** Nauss. *Gas und Wasserfach*, Vol. 75, Dec. 10, 1932, pages 985-988. Discussion of various types of corrosion in gas lines and methods of their avoidance. GN (4)

Maintenance Costs of Pipe Systems. (Ueber die Rohrnetzunterhaltungskosten, deren Höhe und Verteilung.) H. Brückner & W. Ludewig. *Gas und Wasserfach*. Vol. 75, June 18, 1932, pages 509-511. Summary of results of questionnaire sent to 35 German gas works. Of interest to the metallurgist are the cost data given on repair of line systems due to corrosion. GN (4)

5 **Methods for Estimating Corrosiveness of Acid Soils in Contact with Iron and Steel Pipe.** I. A. Denison. *Oil & Gas Journal*, Vol. 31, Sept. 29, 1932, pages 83-87. A general relationship (increase of corrosion with increase of total acidity) is found with well developed humid soils such as occur in the eastern part of the U. S. This does not apply to the alkaline soils in the arid or semiarid regions of the middle and far west or to marshes and soils which have been contaminated by material from some external source such as overflow waters from oil wells. Alternative methods for determining total acidity of soils are given. This study is based on the 8-year results of the Bureau of Standards Soil Corrosion Investigation. VVK (4)

Tarnish-Resistant Silver Alloys. K. W. Ray & W. N. Baker. *Industrial & Engineering Chemistry*, Vol. 24, July 1932, pages 778-782. The Ag-Zn-Al system containing from 75 to 100% Ag is investigated. Several alloys of Ag with Cr, Zn, Al, Be, Cu, Si, Sn, and Ba as binary, ternary and quaternary alloys are studied. An attempt is made to nitride the various alloys with gaseous ammonia at a somewhat elevated temperature in the hope that a tarnish-resistant case will be formed. 12 references. MEH (4)

Is the Application of Trisodium Phosphate for Boiler Water Conditioning Detrimental? (Ist die Anwendung von Trinatriumphosphat zur Speisewasserpflege unschädlich?) P. Robert. *Schweizerische Technische Zeitschrift*, Vol. 29, Aug. 18, 1932, pages 497-503; Aug. 25, 1932, pages 513-517. Discusses cases of corrosion and their causes in a boiler due to addition of sodium phosphate to feed water. The cases were studied at various pressures, temperatures, durations, and concentrations of sodium phosphate. A special testing apparatus is described in which limiting values of factors affecting corrosion are to be determined, as composition, temperature and circulation velocity of water and boiler materials. GN (4)

How Cadmium Resists Aqueous Solutions. B. E. Roetheli, A. J. Franz & B. L. McKusick. *Metal Industry N. Y.*, Vol. 30, Sept. 1932, pages 361-363. Contains bibliography. Partially paraffin coated Cd specimens were immersed in a continually flowing, uniformly agitated, aerated corroding medium whose pH was controlled by additions of HCl or of NaOH. When the pH is below 5.9, the corrosion is inversely proportional to the pH. The probable safe minimum pH of oxygenated solutions in which cadmium is to be immersed is 6. At pH greater than 5.29 colored corrosion products result. PRK (4)

Masked Hydrogen Embrittlement in Brittle Copper Wires. (Verdeckte Wasserstoffkrankheit an brüchigen Kupferdrähten.) C. Schaarwächter. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 234-236. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. Laboratory experiments on H annealing of Cu containing Cu_2O, with subsequent heating in air, show presence of 3 zones: innermost containing Cu_2O, next free from Cu_2O owing to reducing action of H but containing hair-cracks formed by reduction of Cu_2O and formation of water vapor; and outermost showing penetration of Cu_2O along hair-cracks. Heating in CO instead of H gives similar results. Brittleness of such Cu is ascribed to penetration of Cu_2O along hair-cracks. In practice similar zones occur but hair-cracks cannot be found. Mechanism of embrittlement in practice, where hair-cracks cannot be found (*"verdeckte Wasserstoffkrankheit"*), is same as that which obtains in laboratory experiments with H. RFM (4)

Eloxal Process. (Das Eloxalverfahren.) Hans Schmitt. *Metallwirtschaft*, Vol. 11, Dec. 16, 1932, pages 689-690. Process consists of producing an oxide coating on surface of articles made of Al or Al alloys by electrolytic means. Electrolyte consists of an oxalic acid solution with addition of a strong mineral acid. By proper choice of concentration of solution, temperature, current density and voltage, structure and properties of oxide coating can be varied to suit several purposes. For wire, strip and foil an elastic film can be produced which will withstand bending and has good electrical insulating properties. If desired it can be made sufficiently porous to absorb insulating or Bakelite varnish, resulting in high electrical resistance. A very hard coating can be produced which is used on screws, valves, gas cocks and hose couplings. Another application is for vessels which are to resist corrosion of fruit juices and wine. For this purpose vessels are sometimes impregnated with linseed oil and then baked. This type of coating has no effect on flavor of liquids. CEM (4)

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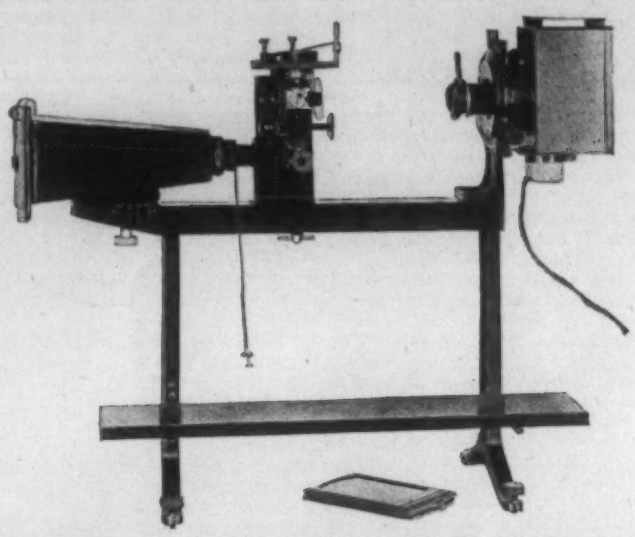

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STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Introduction to Practical Metallography. (Einführung in die praktische Metallographie.) (No. 76 in Breitenstein's Repetitorien.) B. Garre. Johann Barth Verlag, Leipzig, 1932. Board cover, 5x7¼ inches, 51 pages. Price 4.20 R.M. Typical equilibrium diagrams are shown with diagrammatic black and white sketches of the structures and grain size of the alloys of various compositions and heat-treatment inserted, and with physical property charts below the diagrams. As the eye runs down the line for a given composition, one grasps the equilibrium relations, the structure, and the properties together in quite effective fashion. The scheme should be of distinct value as a method of instruction.

The scope of the pamphlet is not wide, as it covers only steel and cast Fe with a very little on alloy steels, Cu Ni, Sb Sn, Pb Sb, Al Mg, Al Zn, Cu-Cu_2O, brass, bronze, Al Si, and a little on duralumin, but it should serve excellently as a first introduction to metallography. H. W. Gillett (5a)-B-

Alloys of Gallium with Zinc, Cadmium, Mercury, Tin, Lead, Bismuth and Aluminum. (Ueber die Legierungen des Galliums, mit Zn, Cd, Hg, Sn, Pb, Bi and Al.) N. A. Puschin, S. Stepanovic & V. Stajic. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Dec. 1932, pages 329-334. Constitutional diagrams of above alloys were developed. It was found that Ga forms with Cd, Hg, Bi, and Pb 2 immiscible liquid layers, and with Zn and Sn eutectic mixtures. 3 compounds are formed with Al, namely, Ga_2Al, GaAl and $GaAl_2$. Maximum solubility of Ga in molten Pb is 5%, in Bi 11%, in Cd 12-13%. It is practically insoluble in liquid Hg at low temperatures. Ha (5a)

The Constitution of the Copper-Silver Series of Alloys Examined Thermodynamically. F. H. Jeffery. *Transactions Faraday Society.* Vol. 28, Sept. 1932, pages 705-707. The liquid solution consists of monatomic molecules of Cu and of Ag, the solid solutions consist of monatomic molecules of Ag dissolved in monatomic molecules of Cu, and of monatomic molecules of Cu dissolved in monatomic molecules of Ag. The calculations were based on the equilibrium diagrams of Stockdale for the solidus and of Heycock and Neville for the liquidus. PRK (5a)

The Lead-rich Alloys of the System Lead-Antimony Examined Thermodynamically. F. H. Jeffery. *Transactions Faraday Society.* Vol. 28, July 1932, pages 567-569. Based on the data of Schumacher and Bouton, thermodynamic reasoning shows that Sb combines with liquid Pb to form Pb_2Sb, dissolving in excess liquid Pb. Pb_2Sb also forms a solid solution in Pb, accounting for the hardening effect. X-ray analysis differs from thermodynamic analysis in this system, the former giving no evidence of compound formation. PRK (5a)

Physical Chemistry. The Phase Rule. (Lehrbuch der physikalischen Chemie. Die Phasenlehre.) Vol. 4. Karl Jellinek. Ferdinand Enke Verlag Stuttgart, 1933. Paper, 6½x10 inches, pages 625-890. Price 26 RM. This volume contains a few pages on concentrated solutions, completing the treatment of that subject in the previous volume, but the bulk of it deals with the phase rule. A couple of pages are devoted to the metallographic examination of alloys and a few of the typical equilibrium diagrams shown are for alloys. The author deals with general principles, using individual diagrams only as examples, and does not attempt to bring together the latest information on alloy systems. For most of those cited Landolt-Bornstein is given as the reference and corrections based on modern X-ray information are not given. Nor are methods of establishing the alloy diagrams given more than casual mention. Hence, the book is of only secondary value from the point of view of direct metallurgical information.

From that of explanation of principles, it is of primary value. The treatment of ternary diagrams, of isotherms of solid models and of ways of handling quaternary and more complex system, is helpful for reference. It is one of the most comprehensive text books on the subject. H. W. Gillett (5a)-B-

Application of Binary and Ternary Equilibrium Diagrams to the Study of Effect of Sulphur in Steels and Cast Irons. (Application des Diagrammes Binaires et Ternaires a l'Etude de l'Influence du Soufre sur les Aciers et les Fontes.) J. R. Marechal. *La Fonderie Belge,* Vol. 2, Apr. 1932, pages 54-62. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 4. FR (5a)

Division of the Iron-Vanadium-Oxygen System into Some of Its Constituent Binary and Ternary Systems. C. H. Mathewson, E. Spire & C. H. Samans. *Transactions American Society for Steel Treating,* Vol. 20, Oct. 1932, pages 357-384. Authors have studied briquetted and sintered mixtures prepared in vacuo and find that there are 4 oxide phases which may appear separately in equilibrium with Fe, FeO, FeV_2O_4, V_2O_3 and V_2O_2. FeV_2O_4 is an Fe-V spinel sufficiently soluble in Fe to form well crystallized inclusions. Other oxides except FeO are practically insoluble in Fe so that they make satisfactory crucible materials for preparing clean metal. Several of binary and ternary systems have been examined by X-ray and metallographic methods. System FeO-FeV_2O_4 is characterized by an eutectic of approximately 18 mols of FeO and 1 mol of FeV_2O_4. Crystal structure of V_2O_2 is similar to FeO. There is no lower oxide of V and this oxide reduces FeO. Acicular structures similar to Widmanstätten structure are observed in V-O alloys of suitable composition and presumably represent separation of V from the solid solution. 15 references. WLC (5a)

Solubility of Zinc and Aluminum in Magnesium. Correspondence from Ed. Maurer & W. Bischof. *Metal Progress,* Vol. 22, July 1932, pages 54-55. Zn-Mg and Mg-Al equilibrium diagrams based on X-ray analysis are presented. WLC (5a)

Copper Tin Compound in Babbitt. George A. Nelson. *Metals & Alloys,* Vol. 3, July 1932, pages 168-170. The author presents the results of a study of intermetallic compounds present in tin base babbitts. Etching technique for good study of these crystals is given with stereoscopic micrographs. CuSn is in the form of an hexagonal shaped needle of considerable length usually. SbSn appears to initially crystallize on the particles of CuSn. Increase in Cu results in an increase in the size and decrease in the number of SbSn crystals. Less than 2.5% Cu results in rapid depletion of available Cu and the star shaped crystals cannot be formed. CuSn is softer than SbSn. When the six pointed stars described are present points of CuSn crystals penetrate matrix to a considerable distance. WLC (5a)

An Investigation of Al-rich Al-Fe-Si Alloys. Hideo Nishimura. *Tetsu to Hagane,* Vol. 18, Aug. 1932, pages 849-860. Constitution of alloys of Al, Fe, and Si from 0 to 30% of Si and from 0 to 30% of Fe has been investigated using thermal and microscopic analyses. 7 section diagrams whose Fe contents are 1, 3, 2, 4, 10, 15, 20, 25, and 32% of Fe respectively has been studied and from these sections an equilibrium diagram of this system in that composition range has been determined. In this diagram there exist 5 primary crystallization surfaces of Al, $FeAl_3$, $FeAl_3$, $FeSi_2$ (an unknown phase) and Si, the binary reaction curves, Liquid $\rightleftarrows$ Al + $FeAl_3$, Liquid $\rightleftarrows$ Al + $FeAl_3 \cdot FeSi_2$, Liquid + $FeAl_3 \rightleftarrows FeAl_3 \cdot FeSi_2$, and Liquid $\rightleftarrows FeAl_3 \cdot FeSi_2$ + Si, and 3 invariant points, Liquid + $FeAl_3 \rightleftarrows FeAl_3 \cdot FeSi_2$ + Al at 615° C., Liquid $\rightleftarrows$ Al + Si at 578° C., and Liquid + X $\rightleftarrows FeAl_3$ + $FeAl_3 : FeSi_2$. Ternary compound which has hitherto been called X, has been proved to be $FeAl_3 \cdot FeSi_2$ microscopically. TS (5a)

The System Mg-Al-Cu (Contribution a l'étude du système ternaire magnésium-aluminium-cuivre). A. Portevin & P. Bastien. *Comptes Rendus,* Vol. 195, Aug. 17, 1932, pages 441-443. That part of ternary diagram corresponding to triangle Mg-Mg_4Al_3-Mg_2Cu was investigated. System was studied by means of cooling curves, micrographic examination and certain physical properties. Existence of ternary compound $Mg_2Al_3Cu_2$ is indicated. Phase diagrams are given. OWE (5a)

Introduction to Metallography. (Einführung in die Metallographie.) PAUL GOERENS. 6th Edition. Wilhelm Knapp, Hall a.d. Saale, 1932. Paper, 6¼x9¼ inches, 392 pages. Price 15.50 RM. The 3 parts are: I. Theoretical, pages 1-145; II. Practical, pages 146-276; III. Metallography of Technical Ferrous Materials, pages 277-374.

Part I discusses the pure metals, considering thermal changes, crystallization and microstructure. Then follows the discussion of binary alloys classified as to types, with illustrations from actual equilibrium diagrams. Great care has been taken in the application of the phase rule, the exact boundaries of different fields, the relative amounts of the phases present at different concentrations and temperatures. The treatment of ternary systems is brief, only about 6 pages. Cu-Sn and Cu-Zn alloys are treated in considerable detail. Ferrous alloys are discussed, pages 84-145, in considerable detail, giving the Fe-C and 20 other binary alloys of Fe. In general, these diagrams are brought up to include recent data, but this is not always the case; for example, in the Fe-Mo system the findings of Takei and Murakami and the more recent work by Sykes have not been included. Likewise in the Fe-W system some of the latest findings have not been included.

The second part (Praktischer Teil) really deals with experimental equipment and methods used in metallographic work. The subjects include furnaces, pyrometers, dilatometers, X-ray equipment and microscopy. Only about 6 pages have been given to X-rays, which is much less than the modern importance of the subject would seem to justify. On the other hand, it seems that too much space and too many details have been given for special microscopes.

Part III, as the title suggests, deals with technical ferrous metallography and covers such subjects as ingots and ingot structures, wrought Fe, cast Fe, plain C steels, alloy steels, microstructures, forging strains, stress lines, etc.

The text is well illustrated with 485 figures, and the references to original literature are quite extensive. The care and detail with which some of the material is presented becomes almost a weakness. Four excellent photomicrographs in color suggest the possibilities of developments along this line.

This text is suitable for beginners and those who have limited knowledge of metallography, but who read German. Oscar E. Harder (5a)-B-

Practical Microscopical Metallurgy. R. H. GREAVES & H. WRIGHTON. 2nd Edition. D. Van Nostrand, New York, 1933. Cloth, 6¼x10 inches, 256 pages. Price $6.00. The number of pages has been doubled, and the number of illustrations increased 40% over the first edition which appeared in 1924. The book has been greatly improved over the first edition in that its scope is materially increased. The first edition was a good discussion of microscopic structures and the technique of showing them. This edition includes all that and also tells a good deal about what the structures mean in terms of the engineering utility of the alloys. It has grown up from a metallographer's book to a metallurgist's book.

Some of the features that the present edition deals with fairly extensively, which were omitted or far less thoroughly covered in the first edition are: microstructure and low-power metallography, deep etching, the gamma loop in alloy steels, precipitation-hardening systems, high tensile structural steels, molybdenum steels, and corrosion and heat-resistant steels.

In the non-ferrous field, the effect of Ag and of Si in Cu, of Al in brass, the aluminum alloy systems, lead alloys and bearing metals, are among the subjects more thoroughly dealt with.

It is a well-written, authoritative volume, well worth a place on the metallurgist's book shelves, and a place close to his elbow. H. W. Gillett (5a)-B-

New Macroscopic Method of Detecting the Sulphur Impurities in Steel. KAROLINA KATZOWNA. *Przemysl Chemiczny*, Vol. 15, Dec. 1931, pages 383-390. (In Polish). S and P inclusions in steel cannot be exactly distinguished by methods of Baumann, and method of van Royen and Ammermann, because there is no distinct difference in reaction of silver salts with H_2S and PH_3. Method of Feigl and Niessner is troublesome in metallographic practice. Cu salts with H_2S give a black deposit, yet they react more slowly with phosphine. Still greater difference in velocity of reaction is presented by the Pb salts. The celloidin photographic paper is treated with $Na_2S_2O_3$ in order to remove the Ag salt. Paper is subsequently washed with water, immersed in 10% solution of Pb nitrate for 5 min., and treated with 2% H_2SO_4 for 2 min. In order to remove the adherent deposit of $PbSO_4$, the paper is washed out and wiped off with cotton. Before use the paper is immersed in 5% H_2SO_4 for 1 min., and then pressed to the polished and degreased surface of specimen for 5 min., whereupon paper must be carefully washed. Time of pressing is too short to produce any perceptible spots of P. Result thus obtained is then picture of only S inclusions in steel. 10 references. ZJ (5a)

Kinetics of Transformations During the Hardening of Steel. (Zur Kinetik der Umwandlungen bei der Stahlhärtung.) F. WEVER. *Die Naturwissenschaften*, Vol. 20, May 27, 1932, pages 412-416. Magnetic investigation made into decomposition of austenite in relation to temperature and composition. Small needles (5 mm. diameter, 200 mm. long) of an 0.35% C, 0.86% Cr, 4.04% Ni steel provided with a Cu-shell were heated to 860°C., cooled down to and held at testing temperature. Amount of ferro-magnetic crystal phases precipitating from disintegrating austenite were measured with an astatic magnometer. Results are summarized as follows: austenite transformation takes place in 3 different temperature stages according to different laws. In range of first or pearlite transformation, i.e. at 500°-560°C., diffusion velocity of C is sufficiently great to warrant a complete decomposition of austenite into ferrite low in C and into Fe carbide. In second temperature range an intermediary state occurs yet unknown. This state however shows no stability and changes to ferrite and cementite. In third range, i.e. below 270°C., austenite is spontaneously converted into tetragonal martensite, which, at a low rate, further decomposes into ferrite and highly dispersed carbide. The phases are shown in micro-structures. EF (5a)

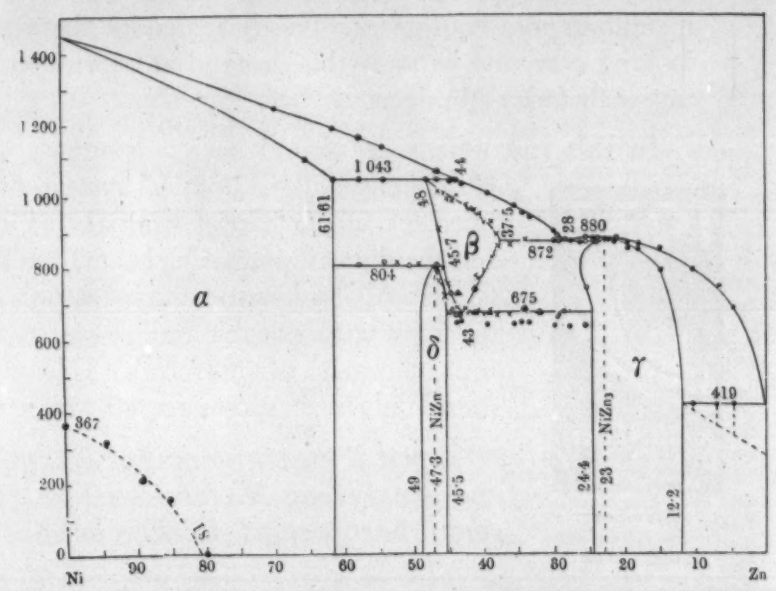
Martensite Crystallization Studied by a Moving-picture Camera. (Die Martensitkristallisation im Filmbild.) H. J. WIESTER. *Zeitschrift für Metallkunde*, Vol. 24, Nov. 1932, pages 276-277. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. Simple C steel was quenched from austenite range to 100°C. and formation of martensite studied by photomicrographs taken at rate of 20 per second in a moving-picture camera. First photomicrographs showed pure austenite, and formation of martensite with time observed. A martensite needle forms fully in less than 1/20 of a second, at temperatures of 100° C. and lower. Illustrated by 4 successive photomicrographs. RFM (5a)

The System Ferrous Oxide-Silica. GAICHI YAMADA. *Suiyokai-Shi* (Transactions Mining & Metallurgical Alumni Association, Kyoto Imperial University, Japan), Vol. 6, 1931, pages 519-543, 561-570; *Memoirs College of Engineering, Kyoto Imperial University*, Japan, Vol. 6, 1931, pages 251-274. FeO of 84-90% purity was prepared by reduction of Kahlbaum's Fe_2O_3 in a gas-mixture of CO and CO_2 at a certain temperature from 800° to 1000°C., relation between composition of gas and reducing temperature being inferred from Fe-FeO curve in the Matsubara's Fe-O_2-C diagram. FeO thus prepared and Merck's SiO_2 were melted in a platinum crucible in a purified nitrogen atmosphere, and thermal analysis was carried out, by means of inverse-rate method using Pt/Pt-Rh couple, in the range of silica contents of less than 45.5%, which corresponds to $FeO{\cdot}SiO_2$. After the thermal analysis the micro-structure was observed. From these experiments, equilibrium diagram of FeO-SiO_2 system was determined and following results were deduced: Melting point of FeO is 1378°C. Eutectic of FeO and $2FeO{\cdot}SiO_2$ exists at composition of 23.5% SiO_2 and at temperature of 1150°C. $2FeO{\cdot}SiO_2$ is unstable at higher temperatures than 1360°C., at which it decomposes to 2 melts. At composition of 39.5% SiO_2 at 1115°C. another eutectic probably of $2FeO{\cdot}SiO_2$ and $FeO{\cdot}SiO_2$ occurs, but existence of $FeO{\cdot}SiO_2$ is not certain. ST (5a)

Method of Preparation of Lead and Lead Alloy Cable Sheath for Microscopic Examination. W. H. BASSETT, JR. & C. J. SNYDER. *Proceedings American Society for Testing Materials*, Vol. 32, Pt. 2, 1932, pages 558-575. Includes discussion. Pb and Pb alloy cable sheaths contain irregularities in grain structure that are best examined microscopically. Where microtome is too expensive, authors have obtained satisfactory results by filing and polishing. Polishing must be done by hand using a circular motion on emery paper and broadcloth backed by plate glass. Gasoline is used as a lubricant and cleaning medium. Different etching reagents are recommended for various alloys. Specimens should be examined by vertical light. Suitable magnifications for Pb are 5 to 75 diameters, for Pb-Sn alloys 20 to 200 diameters, and for Pb-Sb alloys 50 to 500 diameters. Photographs are included. VVK (5a)

Metallography. Report of A.S.T.M. Committee E-4. C. H. DAVIS, Chairman. *Proceedings American Society for Testing Materials*, Vol. 32, Pt. 1, 1932, pages 507-509. Progress reports of subcommittees. VVK (5a)

On the Equilibrium Diagram of the Binary System, Nickel and Zinc. KANZI TAMARU. *Kinzoku no Kenkyu* (In Japanese), Dec. 1932, pages 511-526; *Science Reports Tohoku Imperial University*, Vol. 21, 1932, pages 344-363. Equilibrium diagram of system Ni-Zn was investigated by total and differential thermal analyses, electric resistance and differential dilatometric measurements in nitrogen atmosphere. Effect of Zn upon magnetic transformation of Ni was also studied. Liquidus obtained is nearly same as that of Tafel. α solid solution extends to 61.61% Ni at 1403° C. Range of β solid solution on Zn side reaches 37.5% Ni at temperature of eutectic reaction; eutectoid transformation of β solid solution extends from 44.74 to 24.4% Ni at 675° C. This transformation takes place at about 700° C. on heating and at 640° C. on cooling, so that mean tempera-



ture 675° C. is adopted. Compound NiZn or δ solid solution has a solubility on both sides and is found to be homogeneous between 49 and 44.74% Ni. Reaction $\alpha + \beta \rightleftarrows \delta$ takes place at 804° C. Compound $NiZn_3$ has also a solubility of 1.4% Ni on Ni side. Liquidus and eutectic horizontal near $NiZn_3$ are distinctly found by differential thermal analysis, sensibility of which is 25°/1000 for 1 mm. scale deflection, and hence Bauer and Hansen's view regarding peritectic reaction is not valid. According to X-ray analysis, α-solid solution has face-centered cubic lattice, β and δ, hexagonal and γ, cubic which is very similar to that of α-manganese. KT (5a)

Graphite in Cast Iron. (Le Graphite dans la Fonte.) A. ALLISON. *Bulletin de l'Association Technique de Fonderie*, Vol. 5, Mar. 1932, pages 82-83. A summarized translation. See *Metals & Alloys*, Vol. 2, Feb. 1931, page 34. FR (5a)

On the Grain Refinement of Copper-rich Alloys by Peritectic Reaction. J. ASATO. *Kinzoku no Kenkyu*, Japan, Sept. 1932, pages 392-411. It is well known that grain size of Al bronze becomes very fine when Fe is added, but there has been no clear explanation of it. Author found, after studying Cu-Fe, Cu-Zn-Fe, Cu-Sn-Fe, Cu-Mn-Fe, Cu-Ni-Fe and Cu-Al-Fe alloys, that grain refinement is closely related to peritectic reaction between Cu and Fe, and that Fe may be replaced by Co. In each case grain size decreased to 1/1000 ~ 1/10,000 when Fe was added over peritectic point. Effects of cooling velocity and casting temperature upon grain size were also investigated but no marked effects were observed in these cases. KT (5a)

The Constitution of Copper-Tin-Lead System. B. BLUMENTHAL. *Metals & Alloys*, Vol. 3, Aug. 1932, pages 181-182. Correlated abstract. Cu-Sn-Pb alloys are discussed in light of several constitutional diagrams which are shown. Compositions and services for which these bearing alloys are useful are referred to in 9 references. WLC (5a)

Structure of Heat Treated Low Carbon Steel. WELTON J. CROOK & EDMUND C. BABSON. *Metals & Alloys*, Vol. 3, Aug. 1932, pages 183-184. Discusses results of a study of structural changes in 0.20% C steel when quenched at temperatures from 1300° up to 1650° F. This steel gives martensitic areas when quenched between Ac_1 and about 1420° F, which martensite reacts toward drawing normally passing through troostite, sorbite, to a spheroidized pearlite. When quenched between 1420° F. and Ac_3 a troosto-martensite is obtained and when quenched just above Ac_3, 1550° F. an almost entirely troostic structure is obtained which does not change with drawing except for a gradual growth of cementite particles and elimination of acicular structure. 6 references. WLC (5a)

Investigations on the Transformations in Solid Phase of Copper-Gold System. (Untersuchungen über die Umwandlungen in fester Phase beim System Kupfer-Gold). M. LEBLANC & G. WEHNER. *Annalen der Physik*, Series 5, Vol. 14, Aug. 1932, pages 481-509. Arrangement is described for casting alloys of high melting point in vacuum and measuring conductivity of cast specimens up to 500° C. While pure Cu showed a secondary electric conductivity depending on grain size, this was not observed in Au. Conductivities of alloys when quenched from high temperatures formed U-shaped curve as is typical for solid solutions. Diagram of conductivity isotherms was developed for tempered alloys below 450° C. showing 3 maxima which mean existence of compounds Cu_3Au, Cu_3Au_2 and CuAu. Ha (5a)

Photomicrographs at Low Magnification. JAMES OSBORN LORD. *Transactions American Society for Steel Treating*, Vol. 20, July 1932, pages 1-26. Author discusses methods of illumination, set-up and apparatus for making low magnification photographs of flat subjects and those with varying degrees of relief. WLC (5a)

Relation of Iron-nitride to Plastic Flow and to the Fry Etch. C. W. MACGREGOR & F. R. HENSEL. *Journal of Rheology*, Vol. 3, Jan. 1932, pages 37-52; extended abstract, *Metals & Alloys*, Vol. 3, May 1932, pages 127-128. Discusses utility of Fry reagent in showing plastic flow in materials containing N as iron nitride. WLC (5a)

Structure & X-Ray Analysis (5b)

Applied X-Rays. George L. Clark. 2nd Edition. McGraw-Hill Book Co., New York, 1932. Cloth, 6x9 inches, 470 pages. Price $5.00. This popular book, first appearing 6 years ago, is now offered to the public in a new and enlarged edition, in form and treatment departing little from the first edition. This new edition discusses the latest developments in the field of applied X-rays and also much of the physics basic to such developments. It includes discussions of X-ray tubes and high tension equipment; X-ray spectra; absorption and scattering of X-rays; radiography; physical, chemical, and biological effects; crystallography; diffraction; X-ray diffraction methods of analysis; interpretation of diffraction patterns; results of crystal analysis; structure of alloys; structure of compounds; practical application of X-rays in many fields; colloids; organic substances. In the preface the author disclaims any intention of writing a handbook for the complete and precise determination by experts of wave-lengths or crystal structure. He wishes the book to serve as a "missionary," to depict the "promise for the layman in industry and in the class room" in the application of X-rays as a new tool for industry. The book covers a large field, with a surprising number of examples of the practical application of X-rays. The sections on X-rays are fairly well balanced, though occasionally lack of balance is evident. There seems to be little use in such a prolonged treatment of X-ray line spectra (Chapter V) for a book of this sort, whereas a bit more detail with respect to new X-ray tubes of foreign manufacture would be welcome. Also a diagram of intensity versus wave-length for a tube operated above the voltage at which the characteristic radiation appears would be useful to a student since this is the normal condition for most diffraction work.

The treatment of X-ray methods and crystallography is less satisfactory. Several of the familiar methods are described, but in no case is sufficient information given to enable the student to solve a diffraction photogram. A number of omissions seriously decrease the usefulness of the book. Thus, the Bragg focusing principle should have been briefly explained; the high-precision methods for determining lattice spacing developed by Sachs and others should have been given; the Davey-Wilson orientation camera should have been included. It is a bit surprising that no mention is made of cameras for diffraction studies at high and low temperatures. Omissions are also evident in the crystallographic sections. There is only a bare mention of the stereographic projection though this is probably the most useful graphical method in the study of crystals. Also the face-pole figure developed by Wever is not mentioned, though this is the only really satisfactory method for the representation of fiber structures. The well-known Hall-Davey charts for the solution of powder photograms should have been given. The general usefulness of "four-point" and "six-point" fiber patterns must be doubted, for these can be only a partial representation of fiber structure. The introduction of space-group symbols with no explanation is of little use. These sections, however, are better than the corresponding sections in the previous edition.

The sections on the applications of X-rays make interesting reading. The imagination which has led the author and many others to apply X-ray diffraction methods in a wide field will doubtless in time yield important practical results, and in a small measure has already done so. The reviewer is of the opinion, however, that a too great enthusiasm for partial results has somewhat prejudiced the practical man, that in many cases research effort could be better expended in an attempt to explain the X-ray results obtained rather than to hurry into practical application.

The structural analogies which have been discovered in alloys (Chapter XV) are well treated. The table of the structures of elements (pages 188-189) is useful. But in many ways this section is guilty of over-statements and inaccuracies. The usefulness of the book to industrial metallurgists will depend upon the validity of its statements, and misstatements must be pointed out. The metallurgist will be surprised to read that inclusions in metals may be analyzed by X-rays without dissolving the metal (page 253), that X-rays have made possible a "rationally scientific explanation . . . . . of the properties of various alloy steels in terms of ultimate constitution and structure" (page 303), that as a result of the work of Graf and Glocker and of Tammann "a complete picture of corrosion and resistant mechanism is afforded—all based on the interpretations of X-ray diffraction patterns" (page 305), that the thermal evidence for intermetallic compound formation is (always) a maximum "in the melting point curve" (page 281), that "the interstitial type of solid solution is usually unstable" (page 290). Some important omissions are evident in this section of the book. The newer methods for detecting and measuring internal strain (Sachs, Wever, and Regler) are not mentioned, but considerable attention is given to radial asterism though the use of radial asterism as a quantitative measure of strain is beset with difficulties and uncertainties. The new work of Cameron (1932) on particle size is not mentioned, and the precision of particle size determination is somewhat misrepresented. The structure of Fe_3C proposed by Hendricks should have been mentioned. Certain sections are inadequate and somewhat inaccurate, such as that on age-hardening (page 302), that on the determination of orientations (page 351), that on passive iron—for which there are now results from electron diffraction research, and that on martensite in which there is no mention of the important work of Kurdjumow and Sachs. The book would be more useful if a far greater number of references to sources had been made, and if an author index had been included.

The book in its present form represents essentially an account of what has been attempted by X-rays. In this sense it is useful and at the present moment it is the most extensive account of the kind available in English. R. F. Mehl (5b)-B-

The Structure of Thin Films of Certain Metallic Oxides. W. L. Bragg & J. A. Darlingshire. *Transactions Faraday Society*, Vol. 28, June 1932, pages 522-529. A narrow electron beam was allowed to fall normally on thin oxide films and the diffraction pattern was recorded on a photographic plate. The structure of a thin transparent film of oxide stretched over holes in a thin film of metallic Zn was not the hexagonal ZnO structure but one best explained as a face centered cube of side 4.62 A.U. with certain discrepancies such as misplacement of 111 and 200 reflections and the unaccountable presence of 110 and 321 reflections. Another method of preparing ZnO gave the hexagonal pattern. PbO_2 gave the expected tetragonal rutile structure. SnO_2 gave the rutile type structure with the Sn atoms on a body centered tetragonal lattice with a = 4.72 A.U. and c = 3.17 A.U. PRK (5b)

Electron Diffraction and Inner Potential of Metals. (Elektronenbeugung und inneres Potential der Metalle.) A. Brühl. *Die Naturwissenschaften*, Vol. 20, July 29, 1932, pages 577-578; discussion: R. Frisch. Sept. 9, 1932, page 689. New method of magnetic diffraction analysis for studying the space lattice potentials of metals is stressed and 7 formulae are derived. Determination of inner potential of Ag gave 0 ± 2 volts, while Frisch claims 14 volts in discussion. EF (5b)

The Structure of Rolled Zinc and Magnesium. (Die Walztextur von Zink und Magnesium.) V. Cagliotti & G. Sachs. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft XXI, 1933, pages 42-46. See *Metals & Alloys*, Vol. 3, Sept. 1932, page MA 268. (5b)

X-Rays as a Research Tool in Chemistry and Industry. George L. Clark. *Industrial & Engineering Chemistry*, Vol. 24, Feb. 1932, pages 182-190. Properties of X-rays which may be applied for research purposes are briefly reviewed. Among many applications are mentioned study of structures of alloys of Fe, for which the periodic classification by Wever is included, detection and estimation of internal strain in crystals, and results of rolling and heat-treating metals to remove undesirable directional properties that are revealed by X-ray fibre patterns. 19 references. MEH (5b)

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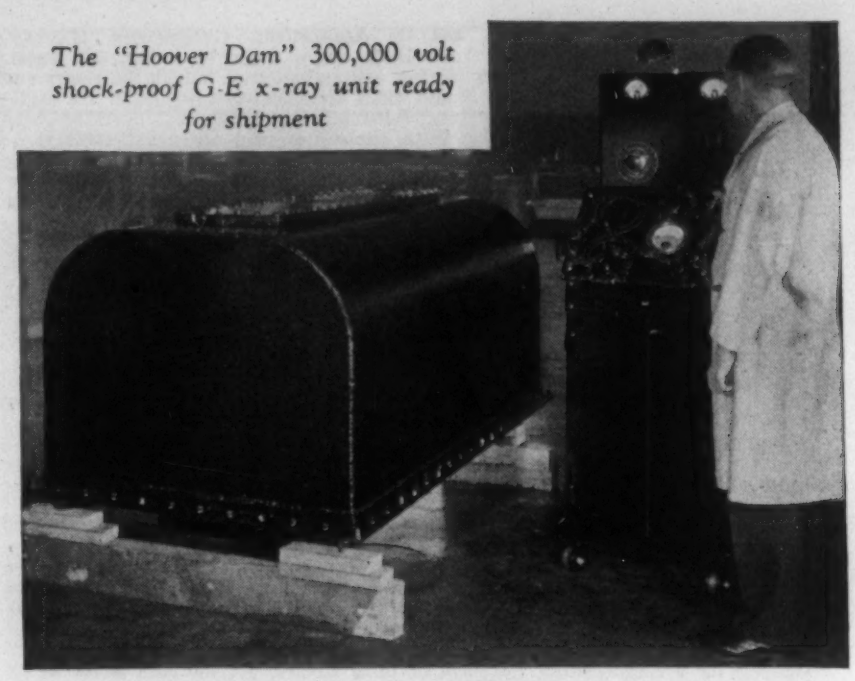

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Chemical Analysis by X-Rays and Its Applications. GEORG VON HEVESY. McGraw-Hill Book Company, New York, 1932. Cloth, 6¼x9¼ inches, 333 pages. Price $3.00. This book covers in clear and authoritative fashion the theory and technique of chemical analysis by X-rays (Part I) and gives examples of the application of this method to the discovery of hafnium (Part II) and to the problems of the chemical composition of the earth, meteorites, and the sun (Part III).

Profesor Hevesy has an entertaining way of writing the parts of the book dealing with the history of the subject. With personal reminiscences he enlivens the story of Roentgen's discovery of X-rays, Mosely's researches, the development of the Bohr theory of atomic structure, and the discovery and isolation of hafnium.

The book is far more than a history, however. The half of the book (Part I) devoted to the instruments, methods, and precautions to be used in qualitative and quantitative X-ray analysis is so complete, so carefully and elegantly done, that it will be invaluable to workers in the field. The illustrations are excellent; a great number of graphs have been advantageously used for clear presentation of the properties of X-rays, and numerous microphotometer traces of spectral lines to illustrate the author's findings have been included. Extensive tables make the work of practical value as a handbook in the laboratory: X-ray emission lines and absorption limits, percent of photographically effective absorption in X-ray plates, intensity ratios of emission lines, atomic ratios supplying diffraction lines of equal density, reflection angles versus wave-length for calcite and gypsum crystals, a table of elements whose emission lines and absorption edges lie at such wave-lengths as to cause errors in the quantitative analysis of each of the elements from atomic numbers 12 to 92.

In the second half of the book is a most complete listing of the properties of hafnium and its compounds, including a tabulation of the arc and spark lines in the optical spectra of hafnium. There are interesting essays on the age of the earth, the nature and composition of meteorites and their significance with respect to the age of the earth's material and with respect to the composition of the earth, the sun, and the solar system. The presentation of researches in this field is justified by the fact that analysis by X-rays here finds its most effective application. Space was not available for a comprehensive treatment of these studies, yet the book serves as an effective introduction to them and is armed with extensive references to original sources.

In the metallurgical field examples are given of the quantitative analysis of Cu-Zn, Sn-Cd, Pb-Bi, Cu-Zn-Sn, Pb-Zn, and Zn-Sn alloys. The direct method of analysis yields satisfactory accuracy in these cases if the elements are not too widely different in atomic number, but indirect (comparison) methods must be used when atomic numbers differ greatly, such as in Eddy and Laby's determination of the Pb contents of Zn in the range 0.008-0.064% Pb. The sensitivity of X-ray analysis varies with the atomic number of the elements to be determined, reaching 1 part in 10^4 or 10^5 with heavy elements.

The metallurgist should be referred to this book for an authoritative and unbiased comparison of X-ray and optical spectroscopy, or of analysis by absorption discontinuities and by emission lines, or of the relative advantages of primary and secondary radiation in spectroscopy. No previous knowledge of X-ray spectroscopy is required for an understanding of the work; in fact it is probable that a person could make successful X-ray analyses with no other knowledge of the subject than is here given.
C. S. Barrett (5b)-B-

Methods of Crystal Structure Determination with X-Rays. The Laue Method. (Methoden der Kristallstrukturbestimmung mit Röntgenstrahlen. Die Lauemethode.) E. SCHIEBOLD. Akademische Verlagsgesellschaft, Leipzig, 1932. Paper, 6½ x 9½ inches, 173 pages. Price 13 RM. This monograph on the Laue method is the first of a series of 3 on the use of X-rays in crystal structure determination. The second volume, now in press, is devoted to the rotating crystal method and X-ray goniometry; the third, in preparation, covers the powder method. The author confines his attention to those methods which have proved most generally useful and strives for a thorough treatment of these rather than a briefer discussion of all the methods that have been devised. Space is saved by assuming the reader's familiarity with the elements of crystallography, mathematics and X-rays. The result is a text excellent for use in teaching advanced courses in crystallography, and for use as a handbook in the research laboratory.

The first volume contains the trigonometric formulas and graphical methods for assigning indices to Laue spots, well illustrated with examples. The major part of the book covers the Laue methods for the determinations of symmetry, axial ratio, lattice dimensions, translation group, space group and parameters of crystals. Tables giving the missing reflections for space group analysis are not given but their derivation and use are explained. A third of the book is devoted to the intensity of reflection, including Laue's theory, a brief discussion of the dynamic theory, the several intensity factors, the characteristics of the photographic emulsion, and the shape of the Laue spots.

Metallurgical laboratories will find the treatment of reflection from distorted lattices rather brief. Laue methods of orientation determination are barely mentioned, and rotation nets for stereographic and gnomonic projections are not reproduced, but metallurgists will welcome the volume as a most authoritative and detailed treatise on the Laue method of crystal structure analysis. Because of the fact that none of the well-known X-ray books attempt to give exhaustive treatments of technique, this series of monographs is especially acceptable. C. S. Barrett (5b)-B-

Defect Recognizability in X-raying. (Fehlererkennbarkeit bei Röntgenuntersuchungen.) K. HEYER. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 79-81. Paper presented at 25th Anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. Use of X-rays for radiography depends on (1) cost, (2) degree of defect recognizability and measuring accuracy. A brief account is given of tests on the dependence of defect recognizability on tube voltage, focal distance, field range (area to be radiographed) and wall thickness of part to be radiographed. GN (5b)

X-Ray Technique for Examination of Four-Inch Steel. R. E. HILLER. *General Electric Review*, Vol. 35, July 1932, pages 376-380. Advantages of radiography as a method of testing welds are discussed. With new fine-focus X-ray tube and high-voltage outfit capable of operating continuously at 300,000 volts, production examination of more than 350′ of welded seams in mercury boiler drums constructed of plate 4⅛″ thick has been made. The new tube is 4′ long with a bulb 8″ in diam. and is constructed of pyrex glass ¼″ thick. The target is a W disc held in a water cooled Cu block. Auxiliary equipment and plant arrangement is discussed. Exposure and operating details are included as well as typical radiographs of welds. CBJ (5b)

On the Nature of the Tetragonal and Cubic Martensites. KOTARO HONDA & ZENJI NISHIYAMA. *Science Reports Tohoku Imperial University*, First Series Vol. 21, No. 3, Oct. 1932, pages 299-331. First product of quenching C steel is always tetragonal (α) martensite; it is an interstitial solid solution of C in Fe. It is unstable and easily changes into cubic (β) martensite by shocks, such as grinding. The a-axis of α martensite slightly decreases and its c-axis increases linearly considerably with C content. Lattice constant of austenite increases linearly with C content. Quenching temperature does not affect lattice constants of the specimen. By tempering a quenched steel at 100°-150° C., α martensite changes into β martensite. By quenching a C steel in a refined rape seed oil at 150° C., β martensite is obtained. Lattice constant of β martensite increases with C content. β martensite continuously decomposes as temperature is raised slowly but not at a definite temperature. C atoms in martensites are interstitial and their position in the lattice of α martensite is (½, ½, 0), and that in the lattice of β martensite is (½, ¼, 0). Öhman's C_2-replacement theory for structure of martensite was shown to be untenable. AHE (5b)

The Structure of the Surface of Ground Metal Crystals. (Über die Struktur der Oberfläche geschliffner Metallkristalle.) W. BOAS & E. SCHMID. *Die Naturwissenschaften*, Vol. 20, May 27, 1932, pages 416-419. Research work on the structural changes at the surface of metals due to grinding and polishing is historically reviewed. The investigators applied very short-wave X-rays to secure Laue reflection diagrams of Al, Cu, Zn, Cd and Sb. Grinding and polishing of metal crystals results in the formation of 2 layers in the metal (a) a fine-crystalline layer at the surface and (b) a 10 times thicker deformed transitional layer. Crystal orientation exerts a marked influence upon the thickness of the occurring layers. Differences for translation possibilities are responsible for less pronounced penetration depth of disturbances in case of cubic metals. EF (5b)

The Crystal Structure of Black Nickel. H. KERSTEN & JOSEPH MAAS. *Physics*, Vol. 3, Sept. 1932, pages 137-138. Shown by means of X-ray diffraction analysis that electrodeposited black Ni has an amorphous structure which changes to a crystalline structure when deposit is heated. WAT (5b)

X-ray Determination of Alloy Equilibrium Diagrams. ARNE F. WESTGREN. *Transactions American Institute of Mining & Metallurgical Engineers, Institute of Metals Division*, Vol. 93, 1931, pages 13-38. Lecture given Feb. 1931. Deals mainly with the identification of phases in alloy systems, their homogeneity ranges, and structural analogies. The most important work of the author and his associates is reviewed. See also "X-Ray Investigations of the Constitution of Alloys," *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 108. JLG(5b)

An X-ray Diffraction Chamber for Investigations at Elevated Temperatures. (Eine Röntgen-Interferenzkammer für Reihenuntersuchungen bei hohen Temperaturen.) R. BERTHOLD & H. BÖHM. *Metallwirtschaft*, Vol. 11, Oct. 14, 1932, pages 567-569. A newly developed apparatus is described in detail which overcomes the shortcomings of previous types. The sample is heated in a small cylindrical carbon resistance furnace of only .3 mm wall thickness. The end of a thermo-couple is also placed inside the furnace. There are small holes in the wall of the furnace for the entrance and exit of the primary X-ray and the thin wall does not weaken the diffraction rays appreciably. Temperatures up to 1500°C. are obtainable. The apparatus is manufactured by Siemens & Halske A.G. CEM (5b)

Performance and Efficiency in X-raying Welds. (Leistung und Wirtschaftlichkeit der Röntgenprüfung von Schweissungen.) R. BERTHOLD. *Elektroschweissung*, Vol. 3, Nov. 1932, pages 201-205. Paper discusses: (1) technique of X-ray weld seam testing on I-joints, V-, X-, and T-seams, lap welded joints and round seams of small, medium and large dimensions, (2) "exposure factor" and limits of translucence. (The exposure factor is defined as the product of exposure time in sec. by tube amperage.) (3) recognizability of defects, (4) efficiency which depends on technical importance of parts free from defects and on costs of examination, (5) costs of testing weld seams by radiography. GN (5b)

The Persistence and Development of Crystal Nuclei above the Melting Temperature. WILLIAM T. RICHARDS. *Journal American Chemical Society*, Vol. 54, Feb. 1932, pages 479-495. Crystal form may persist above melting point if an adsorbent is present for which heat of binding of crystalline adsorbate is greater than that of liquid adsorbate. This hypothesis is seen to be successful in accounting for behavior of undercooled liquids observed by other investigators, and to supply a plausible explanation for further experiments. Possible applications of this viewpoint to X-ray diffraction, purification of materials, treatment of glasses and alloys, and thermodynamic theory of adsorption are briefly indicated. MEH (5b)

Fine Structure of α-Rays from Thorium C (Sur la structure fine des rayons α du Th C). S. ROSENBLUM & M. VALADARES. *Comptes Rendus*, Vol. 194, Mar. 14, 1932, pages 967-970. Authors repeat previous work with a more powerful electro-magnet and improved experimental conditions. Previous results are confirmed and 2 new lines are observed, one being, however, doubtful. OWE (5b)

Structure and Property Changes during Transition Process. (Allgemeine Gesetzmässigkeiten der Gefüge- und Eigenschaftsänderungen bei Umwandlungsvorgängen.) G. SACHS. *Zeitschrift für Metallkunde*, Vol. 24, Oct. 1932, pages 241-248. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. A review. 20 references. RFM (5b)

A New Method for Testing the Faultlessness of Goldsmith Work. (Eine neue Methode zur Prüfung der Fehlerfreiheit von Goldschmiedearbeiten.) E. SCHIEBOLD & F. LUFT. *Deutsche Goldschmiedezeitung*, Vol. 35, Nov. 5, 1932, pages 448-449. Discusses difficulties encountered in examining faultlessness of gold ware by X-rays which are particularly due to the limited penetrating power of X-rays for metals of high specific gravity. New γ-rays are suitable for radiographic examination of such metals. 4 references. GN (5b)

Internal Stresses in Hardened and Tempered Steel Wire. (Tensioni interne in fili di acciaio incrudito e rinvenuto.) D. FAGGIANI. *La Metallurgia Italiana*, Vol. 24, Aug. 1932, pages 637-642. Steel wire, containing 0.85% C was hardened and then tempered at temperatures varying from 250-650° C., and the internal stresses measured by means of X-rays using the Debye chamber. Above 650° C., the stresses are completely neutralized, and were, therefore used as a basis for comparison. Heating for 10 hours at 250° C. neutralizes only a small percentage of the stresses, while only 30 minutes at 350° C. gives 19% neutralization, and 30 minutes at 400° C. gives over 63% neutralization. The curve, temperature-stress, shows a point of inflection at 400°-500° C., and shows that tempering must be carried out at temperatures over 650°C. in order to eliminate all internal stresses. AWC (5b)

Apparatus for Testing of Materials by X-Rays. (Apparate für die Materialuntersuchung mit Roentgenstrahlen.) O. FISCHER. *Autogene Metallbearbeitung*, Vol. 25, Nov. 1, 1932, pages 321-325. Development of equipment for X-ray testing is reviewed and principal points, i. e. danger of high-tension and danger of physiological effects of X-rays, explained. Various means to obtain a safe, portable unit for testing in shop and other places are illustrated. A chart is given from which times of exposure for different voltages up to 180,000 v. and for different thicknesses of Fe can be taken. Ha (5b)

Transitions in the System Gold-Copper. (Die Umwandlungen im System Gold-Kupfer.) L. GRAF. *Zeitschrift für Metallkunde*, Vol. 24, Oct. 1932, pages 248-254. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. A review. RFM (5b)

Fine Structure in X-Ray Absorption Spectra. J. D. HANAWALT. *Journal of Franklin Institute*, Vol. 214, Nov. 1932, pages 569-584. Writer has considered Kronig idea that following ionization process ejected electron must travel in periodic potential field of crystal lattice in quantum mechanically prescribed way. This theory permits one to understand principal experimental observations. These are as follows: (1) absence of fine structure for isolated atoms, and dependence of fine structure upon atomic aggregate; (2) temperature effect of vanishing of structure; (3) temperature effect of wave-length shift of structure; (4) $\frac{1}{a^2}$ form of energy; (5) identity of fine structures of different elements in same crystal; (6) close relation of character of structure to crystal structure of substance. 20 references. DTR (5b)

The Theory of Magnetostriction. (Zur Theorie der Magnetostriktion). TAKESI HAVASI. *Science Reports Tohoku Imperial University*, Vol. 21, July 1932, pages 268-287. Theoretical investigation of lattice energy of magnetized crystal shows that ferromagnetic substances contract in direction of field and expands in perpendicular direction and that change depends on shape of crystal. Ha (5b)

PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

Fatigue of Metals (6f)

The Testing of Wire and Wire Rope. A. V. DeForest & L. W. Hopkins. *Proceedings American Society for Testing Materials,* Vol. 32, Pt. 2, 1932, pages 398-412. Tests of individual wire are described in which the wire is subjected to reversed flexure with a small steady tension. In the machine used an unmachined piece of wire is held in a motor-driven drill chuck and hung over a sheave wheel on an arc of 90°. The wire is rotated about its axis, and the sheave wheel is slowly rotated away from the drill chuck. A weight is attached to the free end of the wire through another chuck. The amount of stress set up is determined from the diameter of the wire and the diameter of the sheave wheel used. The wire is lubricated, as it rotates in the sheave groove, with oil saturated with colloidal graphite. For preliminary tests reported the following average values were found for endurance ratio (Endurance limit: Tensile Strength): Iron wire 0.60; toughened steel wire 0.47; cast steel wire 0.39; mild plow steel wire 0.34; plow steel wire 0.35; improved plow steel wire 0.29. Some tests of wire ropes were also reported, and testing machines for such fatigue tests described. Comparative tests were made of rope "preformed" in which component wires before being incorporated into rope were formed into the shape of the helix they are to assume in the rope, and of ropes made of wires not so preformed. Preformed ropes showed a decidedly greater fatigue strength than did ordinary ropes in all comparative tests tried. "Preformed" ropes did not develop quite the fatigue strength shown by individual wires. Several other tests of wire and wire rope are described, and a brief discussion of effect of wire rope structure on its strength is given. HFM (6f)

Alternating Torsion Tests Round 360° for Wire used in Aerial Ropeways and Cable Railways (Essais de torsion alternée de 360° sur fils de câbles métalliques pour téléférages et funiculaires). P. Forcella. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 266-277. The usual tests for cables, wires, tension, bending and torsion did not differentiate between wires taken from cables that had failed in service and those that had given good service, but reversed torsion tests involving a comparatively few cycles of twist did differentiate. Low figures for reversed torsion and the splitting of the wire in the test were ascribed to inclusions. It is suggested that the bend test of the present specification be replaced by a short-time repeated torsion test. A test length of 20 cm., a simultaneous tensile load of 4 kg./mm.^{2} for 0.5 mm. and 10 kg./mm.^{2} for 1 to 3 mm. wire and reversed torsion through 360° are suggested. Under these conditions wires of 0.5, 1, 2 and 3 mm. diameter should give 300, 200, 100 and 50 reversals without failure, on wire of 230,000-255,000 lbs./in.^{2} tensile. In this connection the abstractor notes the effort made some years ago by the A. S. T. M. to introduce the requirement at a certain "life" under reversed flexure for staybolts. After a few years' trial the requirement was abandoned as the results in commercial testing proved very erratic. HWG (6f)

Fatigue-Impact and Alternating Bending Tests on Rails of the Italian Railways (L'essai aux chocs répétés a flexion alternée sur les rails des chemins de fer Italiens). P. Forcella. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 247-267. The tensile test, the single blow impact test (Mesnager bar) and the repeated impact test (Amsler machine, grooved bar turned 180° between blows) have been applied to specimens cut from many old rails and from new ones being put in service. Rails that failed in a brittle fashion in service gave both low impact, and low repeated impact figures, the specimens in the latter test breaking clear through and not progressively from the 2 sides as shown by photographs of the fractures. The author so thoroughly believes in the repeated impact test that he terms it the "index of durability." Poor rails, according to Forcella's standard, show about 1 kgm./cm.^{2} impact, and 500-2500 blows in repeated impact, while good ones show 3 to 4 kgm./cm.^{2} and 5000-10,000 blows, and their structure shows a continuous ferrite network. The best composition is about 0.45% C, 1.2-1.4% Mn, 0.05-0.15% Si, 0.15-0.45% Cu. The Mn may be raised to 2% and the C dropped to 0.35% and the rail reheated and normalized, then testing 120,000 lbs./in.^{2} tensile, 6 kgm./cm.^{2} and 12,000 blows. This composition may be compared with American practice which allows a C content in rail steel from 0.60-0.89%. The wear resistance of these low C rails is not discussed, the author apparently being more interested in avoiding the possibility of a shattering fracture than in avoiding wear or end batter. HWG (6f)

Effect of Zinc Coatings on the Endurance Properties of Steel. W. H. Swanger & R. D. France. *American Society for Testing Materials, Preprint* No. 40, June 1932, 19 pages; *Bureau of Standards Journal of Research,* Vol. 9, July 1932, pages 9-24. The paper describes tests made at the Bureau of Standards on open hearth Fe, as rolled and on 0.45 C steel and 0.72 C steel annealed, quenched, and tempered. Rotating-beam and axial reversed stress tests were made on uncoated metal and on galvanized (hot dip) metal. Rotating-beam tests were also made on metal pickled, and on metal electroplated. S-N diagrams and micrographs of steel and of coatings are given. A decrease from the endurance limit of the uncoated polished specimens was shown for the pickled steel, the decrease ranging from zero to 40%, and being larger for the quenched and tempered specimens than for the annealed. For the hot dip galvanized specimens the corresponding decrease of endurance limit ranged from 4.0% to 42.5%, and in this case the quenched and tempered steels were more adversely affected than the annealed. The electroplated specimens showed endurance limits slightly higher than the endurance limits for uncoated and polished metal. The authors state that the difference in the strengths shown by the 2 types of coating is believed to be due to the nature of the bond between Zn and steel and the differences in structure and hardness of the 2 coatings. WAT + VVK + HFM (6f)

The Development of Fatigue Testing in Germany. (Über die Entwicklung der Dauerprüfung in Deutschland). E. H. Schulz & H. Buchholtz. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 278-303. Various types of fatigue testing machines used in Germany are discussed and sketches shown. "Accelerated" tests are not reliable for non-ferrous metals, and on steel get no closer to the truth than can be gotten by calculation from static properties. The effect of notches is discussed in regard to reversed stress alone, and to static stress plus reversed stress, the reversed stress being either between the same, or different, limits of tension and compression. Effect of holes and of a soft skin are also described. Corrosion-fatigue is discussed and beneficial effect of Cu in German Cu Cr structural steel is especially commented upon. There are close relationships between the damping properties, the propensity to damage by notches and the ability to be strengthened by understressing, but so far it has not been possible to express the relationships quantitatively. 35 references. HWG (6f)

Fatigue Failure under Repeated Compression. H. R. Thomas & J. G. Lowther. *Proceedings American Society for Testing Materials,* Vol. 32, Pt. 2, 1932, pages 421-429; *Iron & Steel Industry & British Foundryman,* Vol. 5, Sept. 1932, pages 429-431. Tests of fatigue specimens are reported in which failure apparently occurred under cycles of compressive stress with no reversal to tension. The tests were tests in "one way" bending on T-shaped specimens with the stem of the T in compression. Specimens of ordinary structural steel started fatigue cracks in the compression-stressed stem, but specimens of rail steel and of duralumin did not. An investigation of the plastic action involved in the tests indicated that after a few cycles of stress in the specimens of structural steel there was actually a slight reversal of stress to tension in the stem. Probably this residual tensile stress helped in the formation of a fatigue crack. In the oral presentation of the paper fatigue failures were reported in structural specimens subjected to cycles of axial compression with no reversal to tension. Fatigue cracks have also been observed in rail specimens under repeated loading at regions where the stress seems to be repeated compression with no reversal to tension. CHL+HFM (6f)

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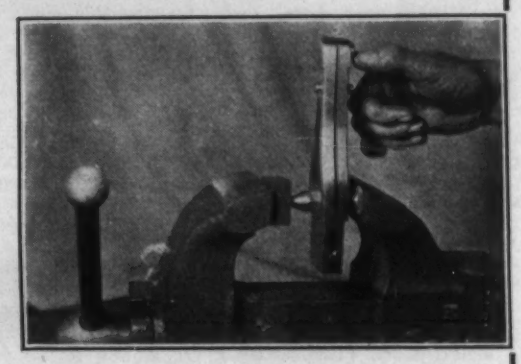

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ELECTRO-CHEMISTRY (7)

The Problem of Electrolytic Dissociation. II. Reply to the Statements of Hammerschmid and Lange. (Das Problem der elektrolytischen Dissoziation. II. Zugleich eine Entgegnung auf die Erwiderung der Herren Hammerschmid und Lange.) K. FREDENHAGEN. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 159, Mar. 1932, pages 81-98; 110-114. This reply to a previous discussion of Hammerschmid & Lange (see *Metals & Alloys,* Vol. 3, May 1932, page MA 128) states that the electrolytic solution or distribution values are closely related to the Nernst electrolytic solution pressure. The only uncertainty adherent to the solution pressure and p-values is, that we only know their relative, but not their absolute value. The author denies that an appreciable contact potential difference metal/metal occurs while measuring e.m.f's. Fredenhagen discusses the relationship between gas atoms and solution ions and declines to interpret the phenomenon of electrolytic dissociation on the basis of electrostatic forces which are replaced by specific chemical forces. EF (7)

Notes to a Discussion with Fredenhagen. Criticism on the Reasons for Neglecting the Galvanic Potential Metal/Metal in Galvanic Cells. (Schlussbemerkungen zur Diskussion mit Herrn K. Fredenhagen. Zugleich Kritik einiger vermeintlicher Gründe für die Vernachlässigung des Galvanipotentials Metall/Metall in der galvanischen Kette.) H. HAMMERSCHMIDT & E. LANGE. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 159, Mar. 1932, pages 100-109. The writers present evidence that the galvanic potential metal/metal in a galvanic cell cannot be disregarded and discuss some further problems on ion transitions dealt with in the controversy with Fredenhagen. (See abstract above.) EF (7)

The Influence of the Electrode Surface on the Conductivity in Dielectric Liquids. (Über den Einfluss der Oberflächenbeschaffenheit der Elektroden auf die Stromleitung in dielektrischen Flüssigkeiten.) H. EDLER & C. A. KNORR. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 158, Feb. 1932, pages 433-440. It is highly probable that the nature of the electrode surface plays an important role during the formation of the charge carriers. Using Pt-electrodes and benzol as a dielectric medium, the experiments proved that the course of the characteristic amp/volt curve actually depends on the hydrogen content of the electrode. EF (7)

The Hydrogen Over-voltage on Alloys. (Die Wasserstoffüberspannung bei Legierungen.) H. FLOOD. *Zeitschrift fur physikalische Chemie,* Abt. A, Vol. 159, Mar. 1932, pages 131-134. Observations on the hydrogen over-voltage on alloys are theoretically interpreted on the basis of Stranski's assumption on crystal growth. EF (7)

A New Electro-Chemical Method in Radio-Chemistry. (Ein neuartiges elektrochemisches Verfahren der Radiochemie.) O. ERBACHER. *Die Naturwissenschaften,* Vol. 20, May 27, 1932, pages 390-393. See *Metals & Alloys,* Vol. 3, June 1932, page MA 170. EF (7)

Electro-chemical Industry. S. WERNICK. *Electrical Review,* Vol. 110, June 17, 1932, page 904. Brief review of electrolytic production and refining of metals, including recovery of precious metals, electroplating and electroforming. MS (7)

The Recovery of Dissolved Gold and Silver by Means of Aluminum. (Die Wiedergewinnung gelösten Goldes und Silbers mittels Aluminium.) R. J. SNELLING. *Deutsche Goldschmiedezeitung,* Vol. 45, Aug. 13, 1932, pages 332-333. Up to the present time precipitation and recovery respectively of Au and Ag from KCN solutions was nearly exclusively done by Zn, Al was found to be much better. A considerable saving in the consumption of KCN can be effected. GN (7)

On the Polarization Potential in the Cathodic Deposition of Zinc from the Aqueous Solution of Zinc Sulphate. T. ISIHARA, K. MIHARA & K. UMETU. *Kinzoku no Kenkyu,* Vol. 9, No. 6, 1932, pages 244-278. The cathodic polarization and the anodic overvoltage in the electrolysis of Zn sulphate solutions of different strength and acidity were measured by a direct method with a normal calomel electrode and a potentiometer. The anode was a platinized Pt plate and the cathode was of Zn electroplated on a coppered Pt plate. Current density—single potential curves were determined for both electrodes up to 12 amp./dm.^{2} at 35°C. The concentration of $ZnSO_4$ was chosen between 0.5 and 3 *N* and that of H_2SO_4 between 0 and 3 *N* with intervals of 0.5 *N*. The single potential of the Zn cathode at no current decreased in its absolute value with increasing $ZnSO_4$ concentration and the formula, $E = E_o + 2.3026 \frac{RT}{nF} \log C$, held in the case of neutral solutions. The decomposition potentials determined from the current-potential curves were found to increase with increasing concentration of $ZnSO_4$, which was explained to be due to the increase of overvoltage of oxygen with increasing $ZnSO_4$ concentration. But both the decomposition and the over-voltages decreased when the $ZnSO_4$ concentration exceeded 2.5 *N*. These general features were found also in the case of acidified solutions, the decomposition potential being maximum at 1.5 to 2 *N* $ZnSO_4$. The maximum was less marked for higher acidities than 2 *N*. When the acidity was varied at constant $ZnSO_4$ concentrations the decomposition potential was maximum at about 1 *N* H_2SO_4. The cathodic polarization was lowered by increase in $ZnSO_4$ concentration, but, in the case of neutral and 0.5 *N* H_2SO_4 solutions, it increased when the $ZnSO_4$ concentration exceeded 2 *N*. Although the cathodic polarization has a general tendency to decrease with increasing $ZnSO_4$ concentration for acidities higher than 1 *N*, discontinuities are stated to exist on the effect of $ZnSO_4$ concentration at about 2 *N*, The cathodic polarization being much smaller in magnitude than the anodic overvoltage, the total polarization is determined mainly by the latter. The overvoltage at the anode generally increased with increasing $ZnSO_4$ concentration. From the point of view of polarization and conductivity, the solutions acidified with less than 1 *N* acid are more desirable than the neutral one in the electrodeposition of Zn. YO (7)

Electroplating (7a)

Gold Solutions for Production Work. J. L. MERIGOLD. *Brass World,* Vol. 28, May 1932, pages 95-97. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 323. WHB (7a)

A Chromium Plating Bath with Fluoride Ion. A. PERLENFEIN. *Rensselaer Polytechnic Institute Bulletin,* No. 39, Feb. 1933, 36 pages. Instead of adding sulphate ion to chromic acid bath as originated by Sargent and followed by Fink, Perlenfein (following up similar work done since 1922 under the direction of M. A. Hunter) uses fluoride ion instead. There is a marked difference in the 2 baths, in that sulphate needs to be kept in constant ratio to chromic acid, making constant control of composition desirable, while fluoride needs only to be kept about constant, while chromic acid content may vary 100%. A bath of 10 g./l. sodium fluoride and 250 g./l. chromic acid is recommended, but chromic acid may drop to 125 g./l. Not much more than 10 g./l. sodium fluoride can be used. Chromic acid sodium fluoride bath has a wider bright-plating range than bath with sulphate, and deposits are brighter, with a more silvery luster. At 45-50° C. the current density may vary from 20 to 60 amp./cm.^{2} or higher. On account of higher current density and efficiency it will plate faster than sulphate bath. Deposit is stated to be more impervious than that from the sulphate bath when plated direct on Fe. Various other advantages are mentioned. Hambeuchen, in U. S. Patent 1,544,451, of June 30, 1925, which antedates the sulphate-control patent, covered chromic acid sodium fluoride electrolytes, but Schneidewind tried to use such baths without results. Perlenfein's preferred composition, however, is within Hambeuchen's range. Literature of chromium plating is reviewed. H. W. Gillett (7a)-B-

Electrometallurgy (7b)

The Production of Heavy Metals by the Electrolysis of Fused Salts. III. Inactive Anodes for High Temperatures. (Ueber die Gewinnung der Schwermetalle durch Schmelzelektrolyse. III. Indifferente Anode fur hohe Temperaturen.) F. SAUERWALD. *Zeitschrift für Elektrochemie,* Vol. 38, Feb. 1932, page 76. A water-cooled Cu anode is described. In order to avoid corrosion in the molten electrolyte ($FeO \cdot SiO_2$) at 1250° C. the anode is placed 5-10 mm. above the surface of the liquid, and the current is passed as an arc across the gap. Even under these conditions, however, the service of the anode is only 2-3 hrs. Ha (7b)

Electrolytic Gold Refining. *Electrical Review,* Vol. 110, June 3, 1932, page 803. Modern method, with HCl electrolyte, consists of using direct current, on which is superposed an alternating-current. Advantages over older method are use of higher current-densities, elimination of Cl evolution, and smooth solution of Au. Anodes made of melted down sovereigns and similar Au coins can be refined at a current density of 116 amp./ft.^{2}, whereas in the absence of a.c., the maximum permissible is 70 amp./ft.^{2}. Ratio of a.c. to d.c. is 1.1, but this may be increased considerably. Bullion containing 20% Ag may be refined at a current density of 112 amp./ft.^{2}, ratio of a.c. being raised to 1.7. Much higher current density can be used for comparatively pure bullion. Scarcely 1% Au enters anode slimes. Superposed current eliminates passivity of Au anode due to layer of AgCl. Elimination of this passivity is most effective when a.c. of low frequency is used. Heating of the electrolyte is unnecessary. MS (7b)

Electrolytic Reduction of Antimony from Ores. N. A. ISGARISCHEV & S. A. PLETNEV. *Tzvetnuie Metallui,* No. 5, May 1931, pages 582-586. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 299. BND (7b)

Electrochemical Industries in Japan. (Les Industries électrochimiques au Japon.) *Journal du Four Electrique,* Vol. 41, Aug. 1932, pages 289-291. Abstract of the paper by Naoto Kameyama presented at the 5th International Congress of Electricity. 6 electrolytic refineries produce practically all Cu made in Japan. Ag and Au are separated either by Moebius or Malbach processes, the former has its scrapers eliminated, the suspension bars for cathodes shaken mechanically to break off the Ag treeing and the cells arranged in cascade. 3 fluosilicate Pb refineries treat 3600 tons per year, practically all Japanese production of the metal. 2 electrolytic Zn refineries make about 4000 tons of the metal a year. In 1929 a sulphate iron electrolytic plant with production of 70 tons per year was started. About 1000 tons of Na are made by electrolysis of hydroxide. A quite ingenious and original electrolytic plant for Mg is being built. No Al is made on account of the lack of bauxite. 3 methods for production of Al_2O_3 are being tried. Suzuki-Tanaka fuses clay with carbon in electric furnaces, removes ferro silicon produced and volatilizes their traces from alumina by heating it with chlorine at 200-400° C. Yamasaki dissolves clay in H_2SO_4, adds $(NH_4)_2SO_4$ crystallizing ammonium alum from the solution containing Fe. Alum is treated with ammonia precipitating $Al(OH)_3$ which is then treated in the usual way. In Tanaka's method clay is treated in an autoclave with a 10% solution of SO_2 in water kept under pressure and at 73° C. Al is separated as sulphite. On heating this solution in open vessels the sulphite decomposes into SO_2 and a precipitate of $5Al_2O_3 3SO_3$ which is entirely free from Fe. It is transformed into alumina by calcination with recovery of SO_2. JDG (7b)

Practical Experiences on the Importance of the Hydrogen Absorption in the Refining of the Surfaces of Metals. (Praktische Erfahrungen über die Bedeutung der Wasserstoffaufnahme bei der Oberflächenveredelung von Metallen.) RICHARD JUSTH. *Oberflächentechnik,* Vol. 9, July 19, 1932, pages 145-148; *Korrosion und Metallschutz,* Vol. 8, Mar. 1932, page 84; May 1932, pages 120-125. The importance of the absorption of gases, especially of H, in the electrolytic refining is pointed out and the part of H in the deposition of metals discussed. All Pt and Fe metals (Co and Ni) absorb H in their electrolytic deposition from aqueous solutions due to the fact that the H atoms discharged during electrolysis are converted into molecular H only after passing through H alloys first. These H-metal alloys are of great importance for the adhesion of the deposits. A practical result of this knowledge was that a corrosion-protective deposit of Cr was not made directly on a metal, as Cr absorbs great amounts of H, but on intermediary layers which actually prevent corrosion and where Cr plays only the part of decoration and hardening and has generally a thickness of 0.05-0.5 mm. The hardness of a metal deposit depends to a greater extent on the composition and operation of the baths than on the H-absorption with exception of Cr deposits. The following table shows some figures:

Metal	Brinell Hardness	Metal	Brinell Hardness	Metal	Brinell Hardness
Lead	3-5	Silver	61-130	Nickel	155-420
Cadmium	12-53	Copper	58-150	Cobalt	270-311
Zinc	40-50	Iron	176-350	Chromium	500-900

The hardness of Cr deposits depends greatly on the current density. In a bath of 250 g. CrO_3/l. and about 45° C. the following values were obtained:

Current density in amp./dm.^{2}	Time in min.	Relative hardness	Current density in amp./dm.^{2}	Time in min.	Relative hardness
16	0.4	1	62	17.5	43
31	2.7	6	78	10.6	26
49	3.8	9	93	9.7	24
			109	9.4	23

The maximum hardness occurred at 62 amp./dm.^{2} It was further stated that beginning with a certain thickness of the deposit the absorption of H becomes less, especially for Ni and Cr deposits. A further factor in the absorption of H is the proper pickling and degreasing. A few practical examples are added to illustrate what is said and to show the harmful influence of H absorption. EF + Ha (7b)

Modern Practice of Copper Electrolysis. (Die heutige Praxis der Kupfer-elektrolyse.) GEORG EGER. *Chemiker-Zeitung,* Vol. 56, June 8, 1932, pages 449-451; June 15, 1932, pages 470-473; June 22, 1932, pages 490-491. A history of the development and review of modern practice of electrolytic Cu production and details of the Wilhelmsburg plant. See also "Copper Electrolysis of the Zinnwerke Wilhelmsburg," *Metals & Alloys,* Vol. 3, May 1932, page MA 129. CEM (7b)

The Electrolytic Refining of Tin at the Mitsubishi Osaka Refinery. II. Z. KIMURA. *Journal Mining Institute of Japan,* Vol. 48, 1932, pages 541-556. Continues previous research (See *Metals & Alloys,* Vol. 3, May 1932, page MA 129). Further studies on the effects of varying the concentrations of cresol sulphonic acid and H_2SO_4 on the electrolysis of the Sn anodes from the Ikuno Mine (concentration of Sn being kept at 4%) are given. Satisfactory results were obtained both as regards the purity of the cathode and the maintenance of the Sn content of the electrolyte when the concentration of the former acid was sufficiently large and that of the latter was less than 4%. When the H_2SO_4 concentration exceeded 4%, the Cu content of the cathode increased and the concentration of Sn ion decreased. The voltage decreased with increasing acid concentration and increased with time of electrolysis, which was not the case with the standard fluosilicic acid bath. In the fluosilicic plus H_2SO_4 mixture, too great an excess of the latter should be avoided. The 2 solutions show no difference in the amount of slime produced. Diminution of Sn ion in the solution during electrolysis depends mostly on the H_2SO_4 concentration. The fluosilicic and H_2SO_4 mixture containing as small amount as practicable of the former is the most economical, but much skill is required in operation. The conditions necessary for obtaining smooth deposits are given. Though gelatine improves the structure of the deposit from both solutions, still better results are obtained by the simultaneous addition of β-naphthol and its presence is essential for obtaining good deposits in the case of prolonged electrolysis. YO (7b)

INDUSTRIAL USES & APPLICATIONS (9)

Welded Pipe Lines Installed in Buildings in the United States. LEROY R. GURLEY. *Welding*, Vol. 3, Sept. 1932, pages 538-542. A list of 227 buildings, power and chemical plants, and refineries in which welded piping has been installed during the past year. TEJ (9)

Use of High Test Cast Iron in Machine Construction. (Verwendung von hochwertigem Gusseisen im Maschinenbau.) *Maschinenkonstrukteur-Betriebstechnik*, Vol. 65, Mar. 5, 1932, pages 29-30. The paper particularly refers to the use of alloy cast iron with special reference to nickel cast iron. GN (9)

The Steel Grate Road. A New Road Pavement. (Die Stahlroststrasse. Eine neue Strassendecke.) F. BRUNNER. *Die Bautechnik*, Vol. 10, Sept. 30, 1932, pages 575-578. Description of a new type steel rod road pavement, developed by the "Arbeitsvereinigung Stahlroststrasse, Fohnsdorf, Styria. The pavement is made from steel rods, angles and flats, joined in the intersection points by welding. Steel St. 00.12 is now used. Tests on experimental roads under heavy traffic were most satisfactory. Tests with Cu- steel are in progress. GN (9)

Will the Use of Iron be a Success in Road Building? Cast Iron as Road Pavement. Grate-like Steel Shapes point new Ways. (Wird sich das Eisen im Strassenbau durchsetzen? Gusseisen als Strassenbelag. Rostartige Stahlbau-Elemente weisen dem Strassenbau neue Wege.) ERICH BECKER. *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Oct. 19, 1932, pages 560-561, pages 561-562.
The first paper gives a survey on methods used and suggested in France and England, and deals with 2 German methods, the system Schlechtriem which uses cast Fe bricks and the system Schmidt-Laufach which uses not a continuous cast Fe pavement but honey combed cast iron grates. The costs of the latter method are much less than of any other pavement. The second paper briefly describes the new Austrian method as outlined by Brunner in *Bautechnik*, Vol. 10, Sept. 30, 1932, pages 575-578. GN (9)

Steel as Road Building Material. The Steel Grate Road. (Stahl als Strassenbaustoff. Die Stahlroststrasse.) ADOLF GSTÖTTNER. *Stahlbautechnik*, supplement to *Montanistische Rundschau*, Vol. 24, Oct. 16, 1932, pages 1-5. The paper describes the new type road pavement as previously discussed by Brunner in *Die Bautechnik*, Vol. 10, Sept. 30, 1932, pages 575-578. GN (9)

PV Factor is Not Proper Measure of Bearing Capacity. P. M. HELDT. *Automotive Industries*, Vol. 66, June 1932, pages 842-845. In recent years engine manufacturers have experienced serious trouble with crankshaft bearings. The loads to which engine bearings are subjected increase rapidly with the speed, and speeds have been rising constantly. Together with the tendency towards increased cylinder numbers, the result is that unit pressures on the projected bearing areas have increased sharply. The 2 most important factors in the life of bearings—apart from the lubricant used—are the unit pressure or unit load on the projected area of the bearing, and the surface velocity or rubbing speed. Heat losses vary with the velocity but not with the pressure. As velocity is increased, the maximum permissible unit-load decreases, because the greater loss results in a higher oil temperature and oil viscosity, and thinner oil will not sustain so high a unit load. A curve illustrates the relation between maximum allowable PV and the sliding velocity for different bearing metals. DTR (9)

Special Profiles for Welded Bridges. (Sonderprofile bei geschweissten Brückenbauten.) L. GERSTENBERG. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Aug. 13, 1932, page 809. Welded lattice work for bridges is reinforced by the use of half I-beams which are split during rolling. Instead of angle iron, flats are often used as reinforcing members. Ha (9)

New Materials for Ore Dressing Machines. (Neuere Werkstoffe für Maschinen der Erzaufbereitung.) E. SEMMLER. *Internationale Bergwirtschaft und Bergtechnik*, Vol. 25, Sept. 15, 1932, page 136. Brief mention of some recently developed non-ferrous alloys. Special bronze "Topal" (free from Zn and Sn) proved highly successful for pumps in the potash industry, special Ni alloys "Admiro 1" and "Admiro 5" were successfully tried for valve seats and valve stems. Admos special bronze "AR" is best for bearings. GN (9)

New Applications of Stainless Metals. C. C. SNYDER. *Refrigerating Engineering*, Vol. 23, Apr. 1932, pages 219-223. A review of the physical and chemical properties of the Cr and Ni-Cr alloys according to type and a detailed table of some 37 applications in the meat packing and allied industries. VVK (9)

Construction Material for Ship Diesel Engines. (Werkstoff-Fragen im Schiffsdieselmaschinenbau.) FR. SASS. *Werft, Reederei und Hafen*, Vol. 13, 1932, pages 64-69. Among the main problems involved in the proper selection of construction material for ship Diesel engines, 4 problems of major interest are singled out referring to the following machinery elements: cylinder cover, piston, cylinder journal bearing sleeve and piston rod. EF (9)

Electro-welded Steel Masts for Over-head Lines. (Elektrisch geschweisste Stahlgittermasten für Überlandleitungen.) H. G. SCHWEPPENHÄUSER. *Elektrizitätswirtschaft*, Vol. 31, Feb. 29, 1932, pages 92-93. The advantages of welded masts in comparison with riveted ones are pointed out. The necessity for properly trained construction engineers and executives is stressed. The genuine tests of the Deutsche Werke Kiel A.G. on an order of 108 masts of 20 m. height are described and illustrated. The top of the masts showed a 48 cm. elastic deflection when being stressed to 1.5 times the maximum permissible load. Data on the design of the welded masts for the 60 kv. transmission line Kiel-Neumünster are presented. The savings in weight due to the adoption of welding amounted to 8%. EF (9)

Welding makes New Type Tanks Possible. WM. REED-HILL. *Industry & Welding*, Vol. 4, Sept. 1932, pages 8-12. The construction by welding of big double-shelled tanks for the storage of oil or volatile liquids with or without provision of heating or cooling by steam, air or water is described. Special advantages of welded tanks are a perfectly smooth interior which reduces cleaning cost to a minimum, no leaks or seepage, no gases to ignite, entire absence of fire risk and evaporation; insurance at reasonable rates; greatly reduced corrosion. The shells can be of Fe or steel. Ha (9)

Springs and Spring Steel. *Engineering*, Vol. 132, Dec. 25, 1931, page 795. Abstract "Report of Springs Research Committee" Department Scientific & Industrial Research. See *Metals & Alloys*, Vol. 3, June 1932, page MA 172. LFM (9)

Contribution on the Calculation of the Bending Stresses in Cable Wires of Aerial Tramways. (Ein Beitrag zur Berechnung der Biegespannungen in den Kabeldrähten von Seilbahnen.) U. R. RUEGGER. *Schweizerische Bauzeitung*, Vol. 99, Mar. 5, 1932, pages 120-121. Problem is solved by simple elementary methods. GN (9)

Concrete Columns with Large Bars Offer Advantages. THOR. GERMUNDSSON. *Engineering News-Record*, Vol. 109, Sept. 8, 1932, pages 277-278.
Columns with a high percentage of 2″ bars save material, floor area and cost over columns designed under codes limiting steel percentage to 6 and bar sizes to 1¼″. The large bar column compares favorably with structural steel encased in concrete. CBJ (9)

Nickel Steels and Alloys in Shipbuilding. (Les aciers et alliages au nickel dans les constructions navales.) JEAN GALIBOURG. *Revue du Nickel*, Vol. 3, Apr. 1932, pages 34-51. A detailed description of the uses of Ni and its alloys in shipbuilding. The compositions of the various alloys are given with their proper and actual use on ships. AH (9)

The Lightening of 300 Suburban Railway Carriages by the Use of Light Alloys. (Allegement de 300 Voitures de Banlieue par l'Emploi des Alliages Legers.) A. DUMAS. *Revue de l'Aluminium*, Vol. 8, No. 42, 1931, pages 1364-1370.
By substituting Al and Al alloys (duralumin, alpax and an alloy containing Cu 2%, Mn 2% and Ni 2%) for certain steel parts of railway carriages, it has been found possible to decrease the weight of the wagons by nearly 6%. Details of construction for roof, doors, window sashes, etc., are illustrated. Ha (9)

The Stresses in Boiler Tubes of Modern Highly Stressed Boilers. (Die Spannungen in Kesselrohren neuzeitlicher Hochleistungskessel.) K. ADLOFF. *Die Röhrenindustrie*, Vol. 24, July 30, 1931, pages 181-182; Aug. 13, 1931, pages 193-194; Aug. 27, 1931, pages 207-208. The fundamental equations covering the calculation of boiler tube stresses are presented and the modifications in design due to the new trends in boiler construction are considered. Emphasis is placed on the tendency toward reducing the tube diameter, increasing the water circulation speed, and reducing the wall thickness so as to cut down the temperature differences and to raise the cooling effect. The improvement of the heat transfer in the highly stressed boilers with small sized tubes is discussed. The stresses occurring are graphically presented and the problem of the stress increase at those parts where the tubes are rolled in, is dealt with. EF (9)

Light-Weight High-Pressure Gas Cylinders. FRANK S. MARSH. *Iron & Steel Institute, Advance Copy* No. 8, Sept. 1932, 13 pages. Small gas cylinders were made from 2 types of Ni-Cr-Mo steel and heat treated. The results of a series of destructive tests described in the article proved that light-weight, high-pressure cylinders can be manufactured to withstand rough handling. The cylinder walls were 0.2″ thick. The cylinders were heat treated to give a tensile strength of approximately 60 tons/in.^{2} and an elongation of 20% in 2″. JLG (9)

Uses of Nickel in Artillery. (Le Nickel dans les fabrications d'artillerie.) MALAVAL. *Revue du Nickel*, Vol. 3, Apr. 1932, pages 52-54. A description of the uses of plain Ni steels, cupro-nickels and stainless steels in artillery constructions and equipment. AH (9)

Two-Ply Stainless Steel Automotive Parts Manufacturing. S. L. INGERSOLL. *Automotive Industries*, Vol. 67, Sept. 24, 1932, pages 392-393. For almost 10 years research has attempted to produce a combination metal. This combination metal was to be used for the central element of wooden spoke artillery type wheels, automobile body hardware and bumpers. A 2-ply stainless clad metal was the apparent solution to the problem, but no successful method was evolved which would assure a perfect weld between the stainless surface and the base metal on a large tonnage basis. The present process of producing 2-ply stainless steel is described. The sheets or plates may be deep-drawn, stamped, formed, welded and highly polished. It is adaptable to welding by gas or electro-welding methods. The character of the 2-ply metal limits its use to those applications where a continuous surface is exposed to corrosion, heat or abrasion. DTR (9)

Steel Use in Marine Construction. (Stahlverwendung bei Marineanlagen.) JUSTUS HORN. *Stahlbautechnik*, supplement to *Montanistische Rundschau*, Vol. 22, Oct. 16, 1932, pages 6-8. The paper discusses the use of steel for frames in dockyards, jetties, gangways, roofs and walls of yard buildings, etc. GN (9)

Ribbed Tubes in Boiler Units. (Rippenrohre im Kesselbetrieb.) H. D'HUART. *Die Wärme*, Vol. 55, Jan. 9, 1932, pages 17-21; Jan. 23, 1932, pages 52-55.
The abundantly illustrated paper historically reviews the evolution of ribbed tubes and fully considers their utilization in combustion chambers, boilers, economizers, super-heater and air heating units. EF (9)

The Introduction of Gallium into Technique. A Metal that melts at 30°C. (Einzug des Galliums in die Technik. Ein Metall, das bei 30°C. schmilzt.) W. HERZOG. *Die Umschau in Wissenschaft und Technik*, Vol. 36, Mar. 12, 1932, page 206. Ga, discovered spectro-analytically in 1875, stands between Al and Zn, melts at 30° C., volatilizes at 2000° C., cost 175 RM/g. in 1931 and now about 9 RM/g. is produced by the Vereinigte Chemische Fabriken Leopoldshall, which also distribute Re at a greatly reduced price. Tests are performed in the Physikalisch-Technische Reichsanstalt with the object of replacing Hg by Ga. Since it is not poisonous, Ga was successfully experimented with in dental alloys. It furthermore offers a valuable substitute for Hg in quartz analysis lamps due to its wider range of radiation frequency. Further tests are under way using Ga as foil for optical mirrors, electric fuses and signal instruments. EF (9)

Light Structural Profiles Made of Hoop Steel. (Leichtprofile aus Bandstahl.) LEOPOLD HERZKA. *Montanistische Rundschau, Stahlbautechnik*, Vol. 24, Sept. 16, 1932, pages 1-4. The results of tensile tests, bending tests and buckling tests are discussed; the experiences gained with such profiles in Austria are reported. GN (9)

Renewable Valve Seats Cut Maintenance Cost by Eliminating Necessity for Periodic Regrinding. P. M. HELDT. *Automotive Industries*, Vol. 65, Nov. 21, 1931, pages 794-796. The use of valve inserts is recommended to combat increased wear and erosion on valve-seats in the modern commercial vehicles. The method of insertion is described and shown diagrammatically. The material of a valve insert must have approximately the same coefficient of expansion as the metal of the block. In addition it must be able to withstand high temperatures and it must not soften materially at high temperatures. It is also considered advantageous to have a seat of a different material from that of the valve itself. Materials in favor are Al-bronze for light alloy pistons, and Stellite, W-Cr-V-steel, or a high-speed W-alloy for engines intended for heavy duty. DTR (9)

Properties of Metal Foil as an Insulating Material. J. L. GREGG. *Refrigerating Engineering*, Vol. 23, May 1932, pages 279-283; discussion, pages 283, 290, 304. An investigation to determine the feasibility of using Al foil as an insulating material gave results as follows: A rigid unit formed by foil sheets held ½″ apart by wooden separators was found to weigh less than 3 lbs./ft.^{3} and to have a thermal conductivity for an average temperature, 100° F. of 0.24 to 0.25 B.t.u. The emissivity of commercial Al foil with respect to room temperature radiation was approximately 5% that of the black body. The emissivity did not change appreciably with age except when the sheets were exposed to the most corrosive conditions. VVK (9)

Flexible Copper Tubing and Its Fabrication. (Die biegsame Kupferröhre und ihre Fabrikation.) W. GREINER. *Apparatebau*, Vol. 43, Dec. 24, 1931, pages 301-302. Description of the manufacturing process of flexible Cu tubings. GN (9)

German Cast Iron Road, System Schmid-Laufach. (Deutsche Gusseisenstrasse, System Schmid-Laufach.) OTTO LEITOLF. *Die Giesserei*, Vol. 19, July 22, 1932, pages 288-290. Cast Fe plates of about 1/3 m.^{2}, one side smooth, the other honey-combed were laid on a bed of usual road material and the honey combs filled with brick splits and tar, and tamped. The road is not slippery and behaved well during 1½ years of operation. Ha (9)

Notes on the Adoption of Alloy Steels as Boiler Material. (Einige Bemerkungen über die Einführung von Sonderstählen als Werkstoffe für Dampfkessel.) E. LUPBERGER. *Elektrizitätswirtschaft*, Vol. 30, Apr. 1931, pages 223-226.
Higher pressures and temperatures commanded the development of new steels for boiler construction. Several impartial German research institutes studied the material offered by industry from 10 different view-points. The particular usefulness of low C, Mo and Cr-Mo steels was established. The new possibilities in the construction of power plants due to the newly adopted alloy steels are summarized. EF (9)

Designing Welded Vibrating Equipment. ASHER H. PATTEN. *Industry & Welding*, Vol. 4, Sept. 1932, pages 2-7. The stresses occurring in equipment or machine parts which have to carry out vibrating motions, as for instance screens, shaking conveyors, etc., are discussed and the failures of constructions of wood and Fe reviewed. Some new constructions of welded parts are described which have stood up well under actual operating tests. Ha (9)

Science Unveils the Mystery of the Razor Blade. J. G. PRATT. *American Photography*, Vol. 26, Sept. 1932, pages 520-524. Experiments with many types of blades showed heavy type blades can give much longer service than thin blades as they can be stropped after they have been dulled, while thin blades do not stand stropping often. Blades from which the waxy substance is removed soon begin to corrode. Ha (9)

Nickel Steel in Bridge Building. (Der Nickelstahl im Brückenbau.) F. Bohny. *Bauingenieur*, Vol. 13, Jan. 1, 1932, pages 15-18; Metzler. *Bauingenieur*, Vol. 13, July 1, 1932, page 373. The paper first gives a survey on the use of 3½% Ni-steel for bridge building in U.S.A. before the World War. The first Ni-steel bridges in Germany were built by the Gutehoffnungshütte and the Krupp Works from 1908-1911 from 2-2½ Ni-steels. This lower Ni content was chosen due to high costs. The American tensile specifications are given. The advantages of Ni-steels are pointed out. The total of all physical properties including fatigue properties and economic considerations finally decides the selection of steels for bridge building. GN (9)

Present State of Construction of Welded Bridges. (Etat Actuel des Constructions de Ponts Soudes.) H. Michel. *Revue Universelle des Mines*, Vol. 7, Series 8, Apr. 1, 1932, pages 372-373. The paper gives a complete enumeration of the 34 welded bridges which have been built since 1922. It gives their manufacturer, the welding process applied, span, width, weight and type, and purpose. The longest span, 1045 ft., is being built now in Dresden. Ha (9)

The Use of the Eloxal Process in the Textile Industry. (Die Anwendung des Eloxalverfahrens in der Textil-Industrie.) *Aluminium, Hauszeitschrift V. A. W. und Erftwerk*, Vol. 4, Apr.-June 1932, page 111. Eloxal-treated Al parts have proved their value. Where great hardness is required they have been advantageously employed. Ha (9)

The Importance of the Eloxal-Process for Fire Departments. (Die Bedeutung des Eloxal-Verfahrens für das Feuerwehrwesen.) W. Sternberg. *Aluminium, Hauszeitschrift V.A.W. und Erftwerk*, Vol. 4, Apr.-June 1932, pages 114-115. Corrosion resistance and lightness and especially a heat-radiation capacity which approaches closely the black body, and further its good heat conductivity have made eloxated Al an excellent material for ladders, hydrants, coupling, wrenches, etc., in the machinery of fire departments. Ha (9)

Increase of Efficiency of Combustion Motors by Treatment of the Pistons. (Erhöhung des Wirkungsgrades von Verbrennungsmotoren durch Behandlung der Kolben.) *Aluminium, Hauszeitschrift V.A.W. und Erftwerk*, Vol. 4, Apr.-June 1932, page 109. Surface hardening with Eloxal of the Al pistons is a very good means to lengthen the life of cylinders. The Al pistons can be more easily and more cheaply renewed. Ha (9)

Increase of Capacity of Electric Induction Furnaces. (Erhöhung der Leistungsfähigkeit von elektrischen Induktionsöfen.) *Aluminium, Hauszeitschrift V.A.W. und Erftwerk*, Vol. 4, Apr.-June 1932, page 110. The coating of Al conductors with Eloxal makes possible the production of a hard, firmly adhering insulating layer which melts only at a temperature much higher than the conductor. As these layers take much less space than other insulating materials and are not sensitive to temperature, power factor and efficiency are favorably influenced by their use. Ha (9)

The Importance of the Eloxal Process for the Construction of Condensers. (Die Bedeutung des Eloxalverfahrens für den Kondensatorenbau.) *Aluminium. Hauszeitschrift V.A.W. und Erftwerk*, Vol. 4, Apr.-June 1932, page 110. Eloxal-coated Al foils make excellent material for building of condensers due to great uniformity of structure and thickness of the coating. Ha (9)

Beryllium Alloys for Springs, etc. (Berylliumlegierungen für Federn und degl.) *Apparatebau*, Vol. 44, Sept. 16, 1932, pages 129-130. D.R.P. 529 945 covers the addition of Be to Fe, Cu, Ni, invar, elinvar and similar alloys. For helical springs of Cu, Ni or elinvar 1-2.5% Be are added, finest springs requiring the larger amount of Be. The static and dynamic properties of a few Cu-Be alloys are discussed and compared with those of P-bronze, brass, German silver as applied to springs. The vast superiority of the new alloys is evident. Be bronzes with .9%-1.5% Be are used as bearing metals and show about 1/6 of the wear of Sn bronzes. The procedure in aging 2.5% Be-Cu alloys is discussed. Soldering non-aged Cu-Be alloys offers no difficulties, however, heating above 300° C. is to be avoided. Upon brazing, Cu plating the joint (.05-.1 mm. thick) is advisable. The following pickling solutions are given: 1 part of a solution of 5 g. $KMnO_4$ in 100 cc. H_2O to 9 parts of dilute H_2SO_4 (1 part H_2SO_4 66° Bé to 9 parts H_2O). Another solution is made by adding 1-6 parts of H_2O_2 solution (1 part of 30% H_2O_2 to 2 parts of H_2O) to 100 parts of diluted H_2SO_4. Pickling requires 1-2 hrs. After pickling the parts are lightly brushed. GN (9)

New Alloys. (Neue Werkstoffe.) *Kali, Erz und Kohle*, Vol. 29, Aug. 10, 1932, pages 128-129. The paper deals with properties and application of various Be-alloys after having first given a brief account of the electrolysis of Be as developed by the only European manufacturer of Be, the Siemens Co., Berlin. Ni-Be, Fe-Be and Cu-Be alloys with special reference to Be bronzes are discussed. Be bronzes show low fatigue and high elasticity, to make them most adaptable to all kinds of springs. In many cases where corrosion-resistant and non-magnetic alloys are required steels are suitably replaced by Be-bronzes. Ni-Be alloys possess a high resistance against sea water and attain great hardness by aging. For this reason such alloys are used as hollow needles, tubules and surgical instruments. Special Be-steels have been developed on Cr-Ni base. GN (9)

Chromium Plating Instruments and Tools. (Die Verchromung von Mess-und Arbeitswerkzeugen.) *Chemiker-Zeitung*, Vol. 56, Aug. 10, 1932, pages 629-630. It is recommended to plate calipers, scales, gages, etc., with .005 to .015 mm. Cr. After plating they should be heated for 20 minutes at 200° C. to drive off H_2 occluded during plating. CEM (9)

Cast-Iron Grid Road Surface. *Engineering News-Record*, Vol. 109, Sept. 29, 1932, page 383. Cast Fe grids, the openings of which are filled with asphalt mastic or other surfacing material, are being built in Germany. Advantages are listed. CBJ (9)

Copper Roofs. (Les Toitures en Cuivre.) *Cuivre et Laiton*, Vol. 5, Aug. 15, 1932, pages 343-351. A detailed description is given of the general properties of Cu, especially those of importance when used for roofing, and compared with other metals (Zn and Pb). The methods of joining Cu sheets, water-proofing of roofs and joints, details of construction are explained and illustrated. Ha (9)

Steel for Interior Decoration of Passenger Cars. (Stahl bei der Innenausstattung von Personenwagen.) *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 86, Feb. 1, 1931, page 108. The utilization of steel for railroad coaches is not restricted to the under- and superstructure. The interior equipment of parlor cars, dining and sleeping cars can be made of steel instead of mahogany or other high-grade woods. The fiber structure can be truly imitated and the pattern of marble can also be perfectly copied on steel. Steel furniture can easily be shaped, is clean and fire-proof. EF (9)

Aluminum in Armored Electric Cables. (L'aluminium dans les cables electriques armés.) *Radioélectricité et QST Francais*, Paris, Vol. 11, Dec. 1930, pages 28-30. Information on composition, conductor material, insulation resistance and disruptive strength. Excessive voltages and currents, laying qualities. Cu and Al conductors are compared economically. Note on armoring. GG (9)

Utilization of Aluminum and Light Metals as Railroad Material. (Die Verwendung von Aluminium und Leichtmetallen beim rollenden Material.) *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 87, Feb. 1, 1932, page 74. There are 65 Al casting and 25 forging Al alloys on the market. The utilization of light metals was started in 1923 in the U.S.A. (Illinois Central, Pennsylvania Railroad and Chicago & North Western Railroad). The use of Al is specially recommended for tank cars. Recently Al light metal drawbars and reversing valve rods were introduced. The savings in weight due to replacing steel by Al amounts to 1-15%, occasionally to 35%. Data from 10 different companies showed 18-60% savings in weight and 14-43% savings in power. Each kg. saved due to the utilization of light metals required 1.45-2.25 R.M. (1.85 average) additional expenses. The latter are amortized in 3-4 years. The scrap metal value of light metals is 40-60% of the initial cost. EF (9)

The Metals of Oil-Engine Construction. *Power*, Vol. 76, Sept. 1932, pages 115-117. Diesel frames and cylinders with separate liners are cast of Fe, steel or Al or are fabricated of welded steel. Cylinders without liners are cast Fe. Cylinder liners are cast Fe, steel or hardened Nitralloy. Ni-Resist cast Fe is used for liners in Al cylinders because its coefficient of expansion is about the same as Al. Cylinder heads are usually cast Fe; steel is used on larger units and Al in smaller. Cast Fe is the usual piston material; Al is used in small high-speed units. Piston rods are made of straight C or Ni-Mn steels. Rings are Si cast Fe. Hardened tool steel pins or nitrided and Cr-plated pins are used. Crankshafts are C steel forgings. Bearings are Sn-base alloys, or, for higher temperatures, leaded bronzes. AHE (9)

Provisional Acceptance Conditions for Valve-Steels for Aircraft Engines. (Conditions provisoires de reception relatives a la fourniture des aciers a soupapes pour moteurs d'aviation.) *Service des Fabrications de l'Aeronautique*, Vol. 30, Aug. 1930, 12 pages. This booklet contains the standards for valve steels. The required chemical analyses and physical properties are given with the relative tolerances. In addition, directions for carrying out the tensile test on valves is given. Following alloys are specified: Ni-Cr, Cr-V, Cr-Si-Mo, Co-Cr-Mo, Ni-Cr-W. GG (9)

Light Alloys Save Weight for 300 Suburban Railway Carriages. (Allégement de 300 voitures de banlieue par l'emploi des alliages légers.) *Revue de l'aluminium et de ses applications*, Vol. 8, Mar.-Apr. 1931, pages 1364-1370. Aluminum, duralumin, alpax (Sand cast) and a 2% Cu, 2% Mn, 2% Ni aluminum alloy replaced steel in certain parts of railway carriages. This substitution permitted the Chemin de Fer de l'Etat in France an increased efficiency of 12.5%. AH (9)

Large Freight Cars of Aluminum. (Grossraum-Güterwagen aus Aluminium.) Wernekke. *Aluminium*, Vol. 14, June 30, 1932, pages 4-5. Describes the cars built by the Aluminum Co. of America, 70 tons capacity, weight 17.7 tons against 27.2 tons for the same car of steel. One car contains about 5.7 tons of Al in the shape of sheets, forged and cast parts. Besides saving in weight the resistance against corrosion was an important consideration for their construction. Ha (9)

Entirely Welded Floating Pile Driver. (Vollkommen geschweisste Schwimmramme.) O. Wundram. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Mar. 19, 1932, pages 293-294. Detailed description of construction and power installation of a pile driver for 130 blows per minute, 2000 mkg. Ha (9)

Vanadium Steel for High Speed Machine Tools. (Vanadiumstahl für Werkzeugmaschinen mit hoher Umdrehungsgeschwindigkeit.) *Die Werkzeugmaschine*, Vol. 36, Sept. 30, 1932, page 344. High V- high C tool steels show excellent machining properties at high speed without decreased toughness. V varies between 3.8-6.5%, C between 1.2-1.7%. Similar steels are C-V-Co steels. The favorable properties of V tool steel are probably due to a fine grain and the highly dispersed carbides. GN (9)

The Use of Castings in Welded Structures. J. G. Ritter. *Steel Founder*, Vol. 3, Mar.-Apr. 1932, pages 21-24; *Journal American Welding Society*, Vol. 11, Mar. 1932, pages 2-29; *Welding*, Vol. 3, July 1932, pages 423-424; *American Machinist*, Vol. 76, Feb. 4, 1932, page 167; *Machine Design*, Vol. 4, Mar. 1932, pages 40-41. Paper presented before a meeting of the Steel Founders' Society of America, in Chicago. See also *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 300. Ha+TEJ+RHP (9)

On the Possibilities of Development of Steel Frame Buildings in Middle Europe. (Über die Entwicklungsmöglichkeiten der Stahlskelettbauten in Mitteleuropa.) Johann Tille. *Stahlbautechnik* supplement to *Montanistische Rundschau*, Vol. 24, Oct. 16, 1932, pages 5-6. The paper discusses the difficulties in constructing steel frame buildings in Austria and Czecho-Slovakia. GN (9)

Advances in Modern Railway Passenger Coach Construction of the German States Railway. (Entwicklung neuzeitlicher Eisenbahnpersonenwagen bei der Deutschen Reichsbahn.) Stroebe & Wiens. *Organ für die Fortschritte des Eisenbahnwesens*, Fachheft "Personenwagen," Vol. 87, Feb. 1, 1932, pages 21-40. The abundantly illustrated paper gives a most complete account of the latest advancements in German railway car construction. The interest of the metallurgist is in the chapters "Fundamental Differences between Wood and Steel Construction," "Municipal Railway Cars of Light Metals" (City Express Coaches), "Light Metal Construction Applied to Regular Railway Coaches" and "How can the Low-weight Construction be Achieved?" EF (9)

Copper-Silicon Alloys, New Material for the Construction of Apparatus and Machines. (Kupfer- Silizium- Legierungen, neue Werkstoffe für den Apparate- und Maschinenbau.) Erick Becker. *Apparatebau*, Vol. 43, Oct. 16, 1931, pages 241-242. Survey on Cu-Si alloys to be used for the mentioned purpose. Binary Cu-Si alloys are a high quality substitute for binary Cu-Sn alloys. Alloys with 3.7-6.7% Si can be improved by aging and are used as rolled products. For castings alloys with 2.5-4.5% Si with about 2% Zn are best. Improved binary Cu-Si alloys are distinguished by high corrosion resistivity. Casting alloy Everdur 50 is most adaptable to armatures. Isima bronzes contain Cu, Si, Mn. Corson alloys, containing Cu, Si, Cr, Fe, Ni or Co are best fitted for thin-walled vessels and containers of chemical industry. Tombasil contains 3-5% Si, 10-18% Zn in addition to Cu and its tensile strength decreases but slightly up to 300° C. (20° C.: tensile strength 64.3 kg./mm.^{2}, elongation 19%; 300° C.: tensile strength 59.1 kg./mm.^{2}, elongation 16.8%). This alloy is particularly adaptable to thin-walled castings. Its corrosion properties are similar to that of Cu. GN (9)

Aircraft Engine Steel. N. L. Deuble. *Paper presented before the American Society of Mechanical Engineers*, Aeronautic Division, Buffalo, June 1932, 7 pages. In making steels for use in aircraft engines great care is exercised in all manufacturing operations. They are inspected microscopically and microetched. Charts of steels at 100 mag. have been made up and are used as standards. Specifications of 4 manufacturers for the steel used in crankshafts, the most vital and highly stressed part of an aircraft motor are given. Steels made by electric furnace and open-hearth methods can both give equally good results; the electric furnace is capable of closer control of slag conditions, temperature and atmosphere and can give a sounder, denser and more uniform product from heat to heat. Nitralloy steels are used for gears and wrist and link pins which are subjected to great shearing stresses. Nitriding steels, both Cr-Mo and Cr-V types are being investigated for probable use, also a Cr-Ni-Mo steel with a core-hardness of 30-34 Rockwell C and case hardness 60 Rockwell C after normalizing; the latter type will be particularly suitable for gears and intricate parts now carburized and hardened with difficulty. Due to the great improvement in materials and design the life of an aircraft engine has been lengthened from about 80 hrs. 15 years ago to 1500 hrs. and more at present. Ha (9)

The Heat Treatment and Use of Aluminum Alloys for Aircraft Structures. Part II. Robt. J. Anderson. *Fuels & Furnaces*, Vol. 9, Dec. 1931, pages 1375-1380. Al alloy tubes, stampings, sheets, etc., are assembled by riveting. Alclad sheeting (0.0095" thick) for dirigibles is sewed together by automatic riveting machines. Al parts are heat treated either before or after assembly. Heating to temperatures just short of melting or distortion causes solid solution of the hardening constituents ($CuAl_2$ or Mg_2Si). Quenching at 500° to 530° C. produces a supersaturated solution, the metal then being rather soft. Aging for from a few hours to 6 or 8 days at room temperatures or warmer (e. g. 100° C.) causes a great increase in hardness and strength due to the crystallizing from solid solution of the hardening constituents in a very finely divided state. Selection of exact temperatures and times for quenching and aging depends on the chemical composition of the alloy, whether it is wrought or cast, the mechanical properties desired, the size, shape and mass of the parts, the nature of previous forming operations, and whether heat treatment precedes or follows assembly. CMB (9)

HEAT TREATMENT (10)

Quenching (10d)

Oils Used in Heat Treating Plants. (Beitrag zur Frage der in Wärmebehandungsbetrieben zu verwendenden Oele.) K. Krekeler & F. Rapatz. *Petroleum*, Vol. 28, Apr. 1932, pages 4-7. See *Metals & Alloys*, Vol. 2, Dec. 1931, page 309. EF (10d)

The Use of Oil as a Quenching Medium in Heat Treating. *Lubrication*, Vol. 18, Apr. 1932, pages 37-42. After a brief discussion of the purpose of quenching and some other mediums used the advantages of oil of animal or vegetable nature are discussed. The effect of the viscosity of an oil on the quenching speed is of great importance. The principal requirements of a quenching oil are set forth as follows: (1) Must be capable of developing fairly high quenching speeds uniformly over a relatively wide range of temperatures, that is, at least 100°. (2) It must be as free as possible from volatile constituents in order to insure stability and preclude change in viscosity or body due to excessive evaporation under the high temperatures frequently involved. (3) It must be easily removed from the steel being quenched and (4) be able to retain its quenching power and other characteristics over a suitable length of time. The purification of quenching oils and the removal of C forming in it are described. Ha (10d)

On the Hardening Effect of Repeated Quenching in Carbon Steels. Shozaburo Nanao. *Kinzoku no Kenkyu*, Japan, Vol. 9, May 1932, pages 197-206. It is well known that when imperfectly quenched steels are re-quenched from the same temperature a severe quenching effect is obtained. A method of avoiding the bad effect was investigated by means of magnetic measurement, Charpy impact test, electric resistance measurement and microscopic examination. The results obtained were that: (1) The re-quenched steels contain some retained austenite and the degree of magnetization is lowered; the impact and the electric resistances are increased. (2) If a steel quenched from the proper temperature was annealed at higher temperature and cooled in furnace, it contains much sorbite. (3) When this sorbitic steel was quenched at the same temperature, a small amount of austenite was retained. This was proved by magnetic analysis, the impact test and the electric resistance measurement. (4) To obtain a normal structure by annealing a quenched steel, the cooling rate of the steel must be much slower than the furnace cooling. If the steel treated as mentioned above and having normal structure is quenched again, perfect quenched structure is obtainable. KT (10d)

Oils in Heat Treating Operations. (Oele in Warmbehandlungsbetrieben.) K. Krekeler. *Elektrowärme*, Vol. 2, Feb. 1932, pages 33-36. The oils used for the hardening of steel were investigated; they are divided into (1) hardening oils, (2) tempering oils. For the first group mineral oils and fat oils are equally suitable. The heat must be absorbed so quickly that even large pieces are sufficiently hardened into the interior. The evaporation must be slight, the ignition point as high as possible. For blank-hardening special oils must be used. 3 grades are given. On account of the high ignition point required for tempering oils only cylinder oils can be used which must have a low content of asphalt. The compositions of a few oils are given. Ha (10d)

The Effects of Water Quenching on Soft and Extra-Soft Steels. Aging after Quenching. (Effects de la Trempe a l'Eau sur les Aciers Doux et Extra-Doux. Vieillissement apres la Trempe.) J. Seigle. *Revue Technique Luxembourgeoise*, Vol. 24, Mar.-Apr. 1932, pages 50-59. The observation that mild C steel of about 40 kg. tensile strength if heated to more than 600° C. and quenched in water behaves quite differently from other mild steels of greater resistance, especially the phenomenon of aging after quenching, was further investigated. The tests made and the methods used in the tests are described in detail; the results are discussed and explained by the Fe-C diagram. A quenching temperature of 700° C. had the most favorable effect on the tensile strength; directly after quenching it was about 50 kg./mm.^{2} and after one month had increased to 70 kg./mm.^{2}. Sometimes a steel so treated shows a great sensitivity to impact, but this can be eliminated by reheating to 225° C. See also "New Results of the Influence of Quenching in Water on Mild Steels," *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 326. Ha (10d)

Aging (10f)

Hardness Change of Duralumin with Time and at Different Depths. Franz Bollenrath. *Metals & Alloys*, Vol. 3, May 1932, pages 120-126. Data is presented showing hardness values at various depths and their change with time of aging of quenched duralumin. Brinell and Rockwell hardness tests appear to give an average value for an appreciable depth but the Herbert pendulum time-hardness gives a value more nearly that of the surface tested. The maximum hardness values are attained at a depth of 0.4 to 0.8 mm. The author explains this on the basis of rate of cooling during the quench. At different depths the rate of cooling will be different and with the temperatures employed by the author, 500° to 530° C., a water quench seems to produce a supersaturation condition at this depth that is right for the production of highest hardness. 19 references. WLC (10f)

Form of the Tension-Elongation Curves on the Basis of Measurement of the Temporary Course of Aging of Soft Steel. (Zur Kenntnis der Form der Spannungs-Dehnungs-Kurven auf Grund der Messung des Zeitlichen Verlaufes der Alterung weichen Stahles.) Werner Köster, Hans von Köchritz & Ernst Herman Schulz. *Archiv für das Eisenhüttenwesen*, Vol. 6, Aug. 1932, pages 55-60. Report 184 of Committee on Materials of Verein deutscher Eisenhüttenleute. The temporary changes in some mechanical properties of a 0.10% C open hearth steel were noted after a preliminary stretching of the material. The steel was stretched 5, 10 and 18% at temperatures from 20° to 350° C. and the changes in mechanical properties observed over a period of 3 months. Before being stretched the original steel samples were bars 10 mm. diam. and 100 mm. long. These bars were annealed at 930° C. for ½ hr. and then stored for 14 days at 100° C. giving a very uniform structure equilibrium. The higher the annealing temperature, the more rapid the increase in elastic limit and tensile strength, and also the quicker the decrease in elongation. With a temperature of 100° C. and less the properties pass through a maximum or minimum value, followed by a drop or rise. While the tensile strength, elongation and reduction of area varied with approximately similar rates, the elastic limit varied at a greater rate than that of the tensile strength. By this difference the course of the isotherms of the elastic limit ratio and the length of the flow range for the elastic limit are determined. At low annealing temperatures, particularly, these show sharp maximum values. If the elastic limit ratio is not raised fully 100% by greater stretching, then it may rise above 100% during aging as a result of this rate differential. The difference in rate means that the elastic limit (end point of the curve of elastic expansion) becomes greater than the tensile strength. In such a case the elongation of the steel becomes very small. DTR (10f)

A Special Method of Notched Bar Testing used for Comparison of Aging Tendencies of Steels. (Eine besondere Ausführungsform des Kerbschlagversuches angewendet für den Vergleich der Alterungsempfindlichkeit von Stählen.) R. Walzel. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 405-408. An impact specimen is compressed 10% and then aged by heating 2 hrs. at 250° C. in order to show aging embrittlement. Characteristic embrittlement curves are shown. HWG (10f)

The Age-Hardening of Some Aluminum Alloys of High Purity. Marie L. V. Gayler & G. D. Preston. *Journal Institute of Metals*, Vol. 48, 1932, pages 197-219. Includes discussion. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 327. (10f)

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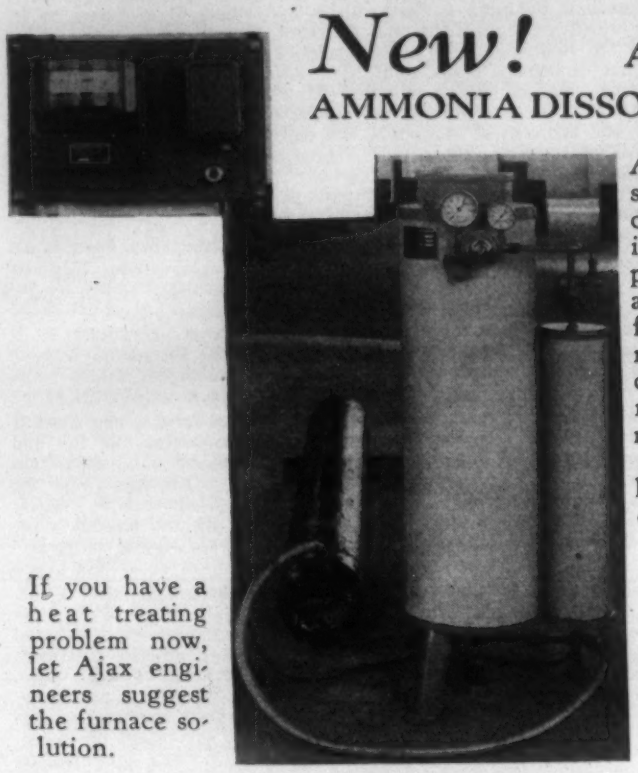

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JOINING OF METALS & ALLOYS (11)

Evolution of Pressure Vessels to Meet Present-day Refining Pressures and Temperatures. H. LeRoy Whitney. *Transactions American Society of Mechanical Engineers*, Vol. 54, 1932, Petroleum Mechanical Engineering, pages 27-30. Review of welding and riveting methods for manufacturing pressure vessels and the outlook for further improvements. Ha (11)

On the Combined Effect of Riveting and Welding with Regard to the Conditions of Initially Loaded Rivet Joints and Joints Reinforced by Welding under Initial Load. (Über das Zusammenwirken von Nietung und Schweissung unter Berücksichtigung der Verhältnisse vorbelasteter und unter Vorlast durch Schweissung verstärkter Nietanschlüsse.) O. Kommerell & G. Bierett. *Die Bautechnik*, Vol. 10, Sept. 23, 1932, pages 566-572. The following tests were made: (1) static tensile and alternating tension fatigue test on riveted joints, (2) static tensile test on welded joints, plates and laps provided with rivet holes, (3) riveted joint, loaded with 12.3 tons, unloaded then welded and static tensile strength determined, (4) 2 riveted joints treated as under (3), but after loading load released only to 6 tons, welded under this load, static and dynamic tensile strength determined. The tests also comprise temperature measurements on rivets during welding and extension measurements on rivets during initially loading. From the latter tests the stress distribution was calculated. The maximum temperatures in the rivets amounted to 200° C., i.e. loosening of rivets during welding need not be feared. The static and dynamic tensile properties are in good accordance, thus indicating that static tests on such joints, proper arrangement and sufficiently fine measurements provided, are a satisfactory yardstick for permissible loads also as regards fatigue properties. The tests prove combination of riveting and welding to be successful unless the riveted joints are in improper condition. About 53% of the load was carried by the rivets, about 47% by the welds. The resistances to deformation of rivets and welds should be approximately alike. Loose rivets are to be replaced before welding. The tests justify the calculation methods, assuming 1/3 of the load to be carried by the rivets and 2/3 carried by the welds. GN (11)

Brazing (11a)

Brazing Metals with Silver Solders. A. J. T. Eyles. *Electrical Review*, Vol. 10, May 1932, page 736. See *Metals & Alloys*, Vol. 3, May 1932, page MA 134. MS (11a)

Welding & Cutting (11c)

Gives Rules for Gas or Arc Welding Rustless Steel. L. W. Hostettler. *Iron Age*, Dec. 31, 1931, pages 1689, 1692. Abstract of paper read at the National Dairy Exposition. See "Allegheny Metal in Dairy Equipment," *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 305. VSP (11c)

Electrically Welded Sheet Beam. (Elektrisch geschweisster Blechträger.) A. U. Huggenberger. *Schweizerische Bauzeitung*, Vol. 98, Dec. 26, 1931, pages 338-341. Results of tensile tests on electrically welded sheet beams without reinforcing fish plates. Upon loading the beams elongation and deflection were measured with a tensometer. Measured results and calculation show good accordance. GN (11c)

The Metallurgy of Welds. J. C. Holmberg. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 23-26. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 6, 1932. The author shows macrophotographs and photomicrographs of bare wire and heavily coated electrode arc welds, pointing out the superior qualities of the latter. The metallurgy of stress relieving is discussed. TEJ (11c)

American Tests on Welded Joints. (Amerikanische Festigkeitsversuche an Schweissverbindungen.) C. J. Hoppe. *Bauingenieur*, Vol. 13, Jan. 15, 1932, pages 48-51. Results of tests on welded joints carried out by the American Welding Society since 1926 are summarized. The deviations of results of various welders are dealt with. The minimum and mean tensile properties in welding tests that are obtained and required are considered. GN (11c)

Stress Distribution in Fillet Welds Subject to Transverse Stress. S. C. Hollister. *Journal Western Society of Engineers*, Vol. 37, June 1932, pages 168-175. This paper shows how to reduce concentrations of stresses in welds for structural connections by using a fillet with a 30° slope. It is based on extensive studies in which polarized light was projected through transparent models under stress. From the results obtained it is concluded that: (1) Excess metal in the weld in the form of rounded beads is of little advantage in the case of welds subjected to transverse shear or tension or both. (2) The critical section for elastic stress does not lie on a section through the throat perpendicular to the sloping face of the weld; but the critical section is the section forming the side of the weld which is in direct transverse shear. (3) Thorough penetration at the root of the fillet is of prime importance. Failure to achieve this penetration considerably increases the stress at this point. (4) A fillet having a 30° slope is more efficient and provides an increased length of the transverse shear plane. GTM (11c)

Strength of Electrically Welded Joints of Boilers. (Résistance des Assemblages par Cordons Frontaux et Latéraux Soudés à l'Electricité.) H. Hoehm. *Chaleur et Industrie*, Apr. 1932, pages 293-300. Results of extensive tests are expressed in formulas for each particular case. FR (11c)

Welded Steel Tube Masts. (Geschweisste Stahlrohrmaste.) A. Hilpert & J. Wanke. *Stahlbau*, Vol. 5, June 24, 1932, page 104. Discussion between Hilpert and Wanke on Wanke's paper in *Stahlbau*, Vol. 5, Jan. 8, 1932, pages 6-8. GN (11c)

Directions for Delivery and Acceptance of Additional Material for Gas and Electric Welding. (Richtlinien für Lieferung und Abnahme von Zusatzwerkstoff für Gas und Lichtbogenschweissen.) Hilpert. *Zwanglose Mitteilungen des Fachausschusses für Schweisstechnik*, No. 20, Mar. 1932, pages 2-4. The regulations for material of welding rods and electrodes with regard to quality, dimensions, supply, testing are given as they are recommended for acceptance in gas and electric welding. Also the chemical composition suitable for each type of welding is recommended. Ha (11c)

Acetylene Welding in Steel Structures. (Azetylenschweissarbeiten aus dem Stahlbau.) H. Holler. *Autogene Metallbearbeitung*, Vol. 25, Aug. 1, 1932, pages 225-232; Aug. 15, 1932, pages 242-252. Numerous examples are illustrated and their method of assembling for structural and decorative purposes explained. Certain rules are laid down for the application of fusion welding in steel structures among which should be mentioned: (1) Designer and welding engineer together must select the arrangement of the welding seams in such manner that the members can be joined without difficulty according to the ideal action of forces. (2) The designer should see, if possible, that only materials of equal thickness are joined in order to secure a uniform conduction of the heat in all directions. (3) Designer and welding engineer should determine beforehand in which sequence the welds are to be made and enter it in the drawing. This sequence must be such that the systems are closed with the final seam. (4) Other welding work should be done before welding the principal seams and the seams with the greatest welding section must be made first. (5) The welding gaps should be as small as possible. The admissible stresses for various kinds of stresses are given in the following table:

Kind of seam	Kind of stress	Admissible stress
Butt welds	tension	0.6 of admissible
	compression	0.75 " "
	bending zone of tension	0.6 " "
	zone of compression	0.75 " "
	shear	0.5 " "
Fillets	all stresses	0.5 " "

The admissible stress is that of the whole weld and can be determined from $s = P/\Sigma\ (a \times l)$, where P is the force to be transmitted by the seams, l the length and a the thickness of the seams. Ha (11c)

Welding in the Fence Industry. B. Heyman. *Welder*, Vol. 3, July 1932, pages 13-20. Examples of fences and gates welded together. Ha (11c)

Welding for Dynamic Stresses. C. Helsby. *Welder*, Vol. 3, July 1932, pages 10-12. The top of a pile driven into the ground by a pile driver was made very successfully of a steel tube with a head plate welded on with a "Special A" covered electrode. This top lasted longer than any other kind under a hammer of 3 tons falling 30"; 1200 blows were necessary to drive the pile in. Ha (11c)

Application of Welding to Pressure Vessels. P. R. Hawthorne. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 19-23. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 6, 1932. For certain classes of vessels, electric arc welding has entirely replaced riveting as well as all other methods of welding. The author describes welding, annealing and testing procedure for Class 1 and Class 2 welding. TEJ (11c)

The Soiling of Welding Torch Nozzles. (Das Verschmutzen der Schweissbrenner-Düsen.) M. R. Granjon. *Revue de la Soudure Autogene*, Vol. 22, No. 197, pages 2060-2062; *Die Schmelzschweissung*, Vol. 11, July 1932, page 145. If the nozzles of welding torches become dirty the uniformity and quality of the weld suffer, and the costs mount. The most effective preventions for this are: (1) Purification of the acetylene. (2) Arrangement of the burner outside of the path of the flying sparks. (3) Change of the shape of the mouth of the burner. (4) Water-cooling. (5) Burners made of rust-proof material. (6) Cr plating of the Cu burners. Ha (11c)

Advancement Made in the Welding Field. LeRoy R. Gurley. *Welding*, Vol. 3, Sept. 1932, pages 517-518, 522. A résumé of progress made in the various branches of the welding industry during the past year and some of the problems that remain for solution. TEJ (11c)

"Hartford Steam Boiler" and Fusion Welding. W. D. Halsey. *Locomotive*, Vol. 39, July 1932, pages 66-75. The welding code and test for welded vessels accepted and required by the Hartford Steam Boiler Inspection and Insurance Co. is described and classification of vessels in accordance with the code is given. Some test results are illustrated. The code was developed in conformity with the code of the A.S.M.E. Ha (11c)

Developments in Aircraft Welding. J. B. Johnson. *Welding*, Vol. 3, Sept. 1932, pages 519-522. See "Developments in Oxy-Acetylene Welding in Aircraft Industry," *Metals & Alloys*, Vol. 3, Apr. 1932, page MA 98. TEJ (11c)

Training Gas Welders for the Job. T. M. Jones. *Welding Engineer*, Vol. 17, July 1932, pages 38-39. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 328. Ha (11c)

Welding of Electron Metal. (Die Schweissung von Elektronmetall.) H. A. Horn & K. Tewes. *Zeitschrift für Schweisstechnik*, Vol. 21, Sept. 1931, pages 201-207; Oct. 1931, pages 222-228. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 328. EF (11c)

Trends towards Welding Construction. G. D. Fish. *Iron & Coal Trades Review*, Vol. 125, Aug. 26, 1932, page 303. **The Trend toward Welding in Construction.** Gilbert D. Fish. *Welder*, Vol. 3, July 1932, pages 22-24. General remarks on advantages and selection between riveting and welding. Ha (11c)

Performance of Welded Seams in Steel Constructions. (Ausführung von Schweissnähten an Stahlbauten.) Kommerell. *Bautechnik*, Vol. 10, Sept. 2, 1932, pages 485-486. In making heavy seams it is of extreme importance to weld with thinner rods. Tensile strength and elongation of seams should amount at least to that of the base metal. Seams welded in vertical, horizontal and inclined position and also overhead welding can be performed with good burning-in of weld metal in the root without the metal burning too deep in the side faces. Endangering of constructions on account of heat stresses due to too high welding currents is pointed out. GN (11c)

The Influence of the Various Alloying Components of the Welding Rod on the Quality of the Acetylene Welding of Structural Steels. (Der Einfluss der verschiedener Legierungsbestandteile auf die Güte der Azetylenschweissung von Baustählen.) H. Kemper. *Die Schmelzschweissung*, Vol. 11, July 1932, pages 156-158. The influence of the presence of P, S, Mn, C and Cu in the welding electrode on the tensile strength and elongation of the acetylene weld is investigated, the composition of some commercial welding wires is given. On the basis of tests it is found that C has the greatest influence on the behavior of a welded seam; wires with high C could be welded without difficulty, with increasing C the tensile strength increases in the same proportion as the elongation decreases. P and Mn exert only a slight influence, as does also S up to 0.04%; beyond this limit red-brittleness occurs. As a most suitable composition for welding of structural steels the following is recommended: C 0.15-0.25%, Mn 0.6-1.0%, P 0.05%, S 0.03-0.04%. The content of Si remaining after deoxidation should be 0.1-0.2%, a content of silica should be avoided entirely. Small additions of Ni, Cr or Mo give also excellent tensile values. The addition of Cu reduces tensile values, increasing amounts of Cu greatly reduce such values, and above 0.75% no satisfactory welds were obtained and the slag formation was so strong that welding was greatly impeded. It seems advisable not to add Cu to the wire as the new structural steels (St 52) contain about 0.5% for corrosion resistance and this small amount will not harm the weld. Ha (11c)

Fusion Welding of Steel Constructions. (Die autogene Schweissung im Stahlbau.) C. F. Keel. *Zeitschrift für Schweisstechnik*, Vol. 21, June 1931, pages 115-126. This article pertains to the welding of supports, columns, angle iron bases and frame connections of girders, giving 28 characteristic illustrations; the different welding possibilities, most of which are complicated, are demonstrated. EF (11c)

Arc Welding Tests with Structural Steel St. 52. (Lichtbogen-Schweissversuche mit Baustahl St. 52.) Küchler. *Elektroschweissung*, Vol. 3, Sept. 1932, pages 161-164. After favorable results were obtained in preliminary tests on arc welding this steel with rods containing 1.2%, 2% and 2.7% Mn (with a rod containing .85% Mn the tensile strength of the joint amounted to 85% of that of the base plate) plates 12 mm. thick, V-weld, of various straight C and alloyed St. 52 steels were welded with d.c. and wires with .65%. 1.21% and 2% Mn. The straight C steel contained .20% C, .80% Si, 1.09% Mn, .018% S, .012% P, .30% Cu. Before testing the welds were machined flush with the plate. Best results were obtained with the 1.8-2.0% Mn wires. They give welds of high tensile strength and notch toughness even when welded vertically and overhead. Practical tests substantiate the test results. GN (11c)

Torch-Cutting Blades of Water Turbines from Cast Steel. (Brennschneiden von Wasserturbinenschaufeln aus Stahlguss.) H. Kalpers. *Maschinenbau*, Vol. 11, June 2, 1932, page 235. Hubs and blades of 5 large water turbines were cast. Previously, the circumference of the blades had been mechanically shaped. It was decided to use oxy-acetylene torch cutting instead. This process required less time and was cheaper than machining. On account of the varying thickness of the material, the pressure of the gas had to be varied between 6 and 9 atmospheres. Cutting speed was 7.1 meters/hour. 7030 liters O_2 were needed for cutting and 500 liters O_2 and 300 liters acetylene for preheating. Mechanical devices secured a constant distance of the burner from the surface of the object. RFV (11c)

Joining Differently Sized Sheets by Means of the Multiple Flame Torch. (Die Verschweissung ungleich dicker Bleche mit dem Mehrflammenbrenner.) C. F. Keel. *Zeitschrift für Schweisstechnik*, Vol. 21, June 1931, pages 133-135. Detailed instructions are furnished for welding operations on differently sized sheets with the multiple flame torch with reference to the various possible seams. EF (11c)

Load Test on Welded Roof Truss. Chas. H. Jennings. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 13-18. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 6, 1932. (1) The method of designing trusses by constructing the tension members from several continuous straps which are disposed throughout the truss so as to automatically increase the cross section of the various members in proportion to the loads which they carry is sound engineering. (2) The actual stresses in the members of such a truss agree very well with the theoretical stresses computed by means of standard methods. (3) The secondary bending stresses in the various members of a truss of this design are relatively low because of the flexibility of the tension members and the joints employed. (4) Strict fabrication specifications are required to insure that all tension straps are kept straight. If they are not kept straight, an undesirable redistribution of stress may occur in some of the composite members. TEJ (11c)

Contribution to the Knowledge of the Temperature of the Oxy-Acetylene Flame and the Quality of the Weld in their Dependence on the Water Vapor Contents in the Acetylene. (Beiträge zur Kenntnis der Temperatur der Azetylen-Sauerstoff-Flamme und Güte der Schweissung in ihrer Abhängigkeit vom Wasserdampfgehalt im Azetylen.) H. Jooss. *Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens*. Vol. 7, 1932, pages 89-108. See *Metals & Alloys*, Vol. 2, Dec. 1931, page 310. (11c)

Welding's Relations to Steel Castings. T. S. Quinn. *Industry & Welding*, Vol. 4, Aug. 1932, pages 3-6, 30-31. 3 trends of thought are discussed which have developed about welding: that it will supplant castings altogether, that castings will never be supplanted, and that there is a definite field for both welding and castings. The design of a piece should in the first place take into account which method is to be applied as only then can a satisfactory result be expected. Fusion welding has been employed advantageously in connecting steel castings to wrought steel parts. Coöperation of the foundryman with the welding engineer is urged to produce composite structures to the best economic advantage for the customer. Ha (11c)

Calculating the Tensile Properties of Welds. (Zur Festigkeitsberechnung von Schweissungen.) Otto Mies. *Elektroschweissung*, Vol. 2, Apr. 1931, pages 61-64; Dec. 1931, pages 238-239. It is shown that within the elastic range the stresses in the seam at equal elongation are smaller than those in the jointed parts, owing to the modulus of elasticity of the weld being lower than that of ingot or cast steel. This is due to the porosity of the weld. In the range of permanent deformations the behavior is opposite to that in the elastic range. The above mentioned occurrences must be borne in mind in calculating weld seams. GN (11c)

Welding in the Paper Industry. D. L. Pellett. *Industry & Welding*, Vol. 4, Aug. 1932, pages 8-11. The advantages obtained in the paper industry by welding various driving mechanisms and other parts of machinery are pointed out and illustrated by examples in plant of Champion Coated Paper Co. Ha (11c)

Examination of Welds with the X-Ray. E. W. Page. *Welding*, Vol. 3, Sept. 1932, pages 527, 547-548. X-ray inspection of welds for defects such as porosity, lack of fusion, slag inclusions etc., is discussed. The author also explains the Laue method of X-ray examination to show presence of internal stresses in weld metal. TEJ (11c)

The Past and Future of Specialization in Welding. James W. Owens. *Welding*, Vol. 3, Sept. 1932, pages 523-524. Large concerns using welding in their plants should take advantage of the experience of well informed welding engineers. Technical schools should offer courses leading to a degree of "Welding Engineer." TEJ (11c)

Metal Deposition in Electric Arc Welding. GILBERT E. DOAN & J. MURRAY WEED. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 31-33. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 4, 1932. Details of a new method for investigation of metal transfer in the electric arc, in which a polished metal strip is moved under the welding arc so rapidly that all of the forms of metal deposition are separated from one another on the strip. An oscillogram shows the welding current and voltage at any given instant. Indications are that liquid globules are the chief form of metal transfer, although there is some metal transfer as vapor and mist. TEJ (11c)

Boiler Defects and Fusion Welding of Boilers. (Kesselschäden und Autogenes Kesselschweissen.) H. BUCHHOLZ. *Die Schmelzschweissung*, Vol. 11, Aug. 1932, pages 161-167. The defects caused by high temperatures, cold forming and subsequent heating, by overstressing and chemical attack are discussed and explained by diagrams and photographs of etched samples. The first important rule for the construction of a boiler is that all treatments and working methods must maintain the toughness of the material. Progressive welding with subsequent refining welding is recommended. Ha (11c)

Arc Welding Process Revolutionizes Ordnance Manufacture, Arsenal Finds. G. M. BARNES. *Automotive Industries*, Vol. 67, Aug. 1932, pages 178-179. **Manufacture of Ordnance at Watertown Arsenal Revolutionized through Arc Welding.** G. M. BARNES. *Welding Journal*, Vol. 29, Aug. 1932, pages 235-239. Details of construction, weight savings, and advantages in strength of an all welded 3" gun carriage which was previously made of cast steel parts. TEJ + DTR (11c)

Development of Welded Pipe Lines for Buildings. ARTHUR E. CHRISTEN. *Welding*, Vol. 3, Sept. 1932, pages 533-535, 543. The author relates the history of pipe welding and predicts that with the cooperation of pipe and fitting manufacturers, before long there will be few pipe installations made which are not welded in whole, from ½" and above. TEJ (11c)

Electrical Welding in Building; The Change from Riveting to Welding in Steel Structures. (Elektrische Schweissung im Bauwesen; die Umstellung von Nietung auf Schweissung im Stahlhochbau.) O. BONDY. *Elektrowärme*, Vol. 2, Feb. 1932, pages 30-33. The development of welding in steel structures since its inception in 1924 is briefly reviewed. Since 1931 it is officially permitted for this purpose in Germany. Several structures are described, and it is shown how new forms have developed which adapt themselves fully to the new method of building and joining structural parts. The saving in weight and costs, the consumption of electrical energy and testing methods are briefly discussed. Ha (11c)

Considerations on the Testing of Fusion Welded Samples by Tearing and Bending Tests. (Betrachtungen über die Prüfung autogengeschweisster Proben durch Zerreiss- und Biegeversuche.) H. BUCHHOLZ. *Die Schmelschweissung*. Vol. 11, July 1932, pages 147-153. It is pointed out that the more the fusion welding technique is employed for the construction of high-grade structures, the more importance must be placed upon the exact rating of the quality of welds and the more should a careful subdivision of the testing methods be applied according to the following points of view: (1) Checking of welder and auxiliary material by means of the full welding sample by tensile and bending test. (2) Testing of the joint on V or X welded samples by tensile and bending tests. The differences in the results on long and short rods are discussed. The bending test often gives a more valuable measure for the quality of a weld than the tensile test. The results of a series of tests with regard to ultimate strength, elongation, reduction, elastic limit, bending angle, etc., are tabulated. Ha (11c)

The Weld-technical Symbols according to DIN 1912, Comparison and Criticism. (Die schweisstechnischen Zeichen nach DIN 1912, Vergleich und Kritik.) OTTO BONDY. *Die Schmelzschweissung*, Vol. 11, July 1932, pages 139-144. The new German symbols for welded seams are illustrated, their development and practical application are explained and directions are given for application in office and shop. Essentially different from those symbols used in other countries. Ha (11c)

Electrically Welded Machinery Hall. (Elektrisch geschweisste Maschinenhalle.) H. MAUSHAKE. *Elektroschweissung*, Vol. 3, Sept. 1932, page 172. Welding of new machinery hall at Technische Hochschule Braunschweig. GN (11c)

Welding Cars for Building Sites. (Schweisswagen für Baustellen.) H. BAUER. *B B C Nachrichten*, Vol. 19, July/Aug. 1932, pages 76-78. Various types of welding cars, Diesel engine driven, are shown and described. GN (11c)

Comparative Optical Investigation of Cutting Nozzles. (Vergleichende optische Untersuchung von Schneiddüsen.) H. MALZ & H. V. CONRADY. *Autogene Metallbearbeitung*, Vol. 25, Sept. 15, 1932, pages 283-287. By the optical Schlieren method examinations and records were made to determine shape and length of the oxygen jet at different pressures with a standard cylindrical nozzle, to compare different types of nozzles with regard to cutting capacity, and to find the flow conditions when the jet hits on any object. The results are reproduced in photographs. It is possible, with the help of such pictures, to select the most suitable nozzle for any particular work. Ha (11c)

Paramount Viewpoints on Utilizing Acetylene Welding for Welding-on of Flanges. (Massgebende Gesichtspunkte für die Anwendung der Acetylenschweissung von Flanschen.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 22, Jan. 1932, pages 5-10. The economical use of welding for high pressure pipe conduits and for pipe lines which are subject to later changes is stressed. Then the procedure of putting on flanges in low pressure pipe lines by crimping of the pipe is shown. Further illustrations refer to the welding of simple flanges for medium and high pressure lines by applying inside, outside and both kinds of Vee seams. Further examples show the welding of flanges on double-walled knees and the manufacture of a large flange ring by cutting say 6 semi-circular steel sections out of an iron sheet and by welding them together. The best kinds of seams are considered and attention is called to the useful Hamburg Bogenring, pipe branch. EF (11c)

Electric Welding & Riveting. E. W. LEWIS. *Electrical Review*, Vol. 110, June 17, 1932, page 898. Reviews briefly welding of ferrous and non-ferrous metals, research in welding and testing of welds, and gives some examples of welded work. MS (11c)

Advantages of Fusion Welded Textile Machines. (Betriebstechnische Vorzüge schmelzgeschweisster Textilmaschinen.) FRANZ KRYNES. *Zeitschrift des Österreichischen Ingenieur- und Architektenvereins*, Vol. 84, Oct. 21, 1932, pages 220-221. Welded spinning machines in comparison with other constructions can be simplified in many respects. A special advantage of the described welded constructions of the author is their quiet operation. GN (11c)

Installations for Increasing the Efficiency of Fusion Welding Shops. (Einrichtungen zur Erhöhung der Leistungsfähigkeit autogener Schweissereien. Druckerhöhung des Acetylens, Brennerkonstruktionsfragen und Schweissmethoden.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 21, July 1931, pages 158-161; Aug. 1931, pages 169-175; Sept. 1931, pages 195-200. Lecture before the Schweizerischer Verband für die Material prüfungen der Technik, 1931. Summarizes recent tendencies to improve the economy of oxy-acetylene welding shops (a) by increasing the flame velocity at the burner tip (120-150 m./sec.) through the agency of larger acetylene pressures up to 3.0 atm., (b) by advancing the torch construction the problems of proper design being discussed and (c) by applying more up-to-date practical welding methods. EF (11c)

Annealing and Improving of Oxy-Acetylene Welded Seams by Treating the Backside of the Seam. (Das Vergüten oder Ausglühen autogener Schweissnähte mittels des Rückseitigen Nachschweissens.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 22, Jan. 1, 1932, pages 11-13. Reports on impact tests and determination of the bending angle on oxy-acetylene welded seams, annealed by reheating with the torch from the backside of the welded sheets. Better physical properties were secured. EF (11c)

Resistance Welding, What It is and What It Does. M. L. ECKMAN. *Industry & Welding*, Vol. 3, Mar. 1932, pages 26-29. The different types of resistance welding and their applications are reviewed and a table is given indicating the cost and energy consumption for electric spot welding of wires from No. 30 to No. 3 assuming the cost of electrical energy to be 1c per kwh. Ha (11c)

Detailing, Listing and Ordering of Machinery Parts for Welding. G. B. CRAMP. *Welding Engineer*, Vol. 17, July 1932, pages 35-37. A procedure of detailing, listing and ordering of machinery parts for welding is outlined. It simplifies and economizes shop and office work. Ha (11c)

Pipe Line Welding. A. F. DAY. *Industry & Welding*, Vol. 4, Aug. 1932, pages 12-13. The pipes are beveled and butt-welded without leaving icicles. The procedure and tools used by the Day Construction Co. are described. Ha (11c)

A Standard Core Electrode for Steel 52. (Eine Einheits- Seelenelektrode für St. 52.) FR. SOMMER. *Elektroschweissung*, Vol. 2, Dec. 1931, pages 225-227. A standard welding electrode was developed for successfully welding the great variety of brands of structural steel St. 52. The alloyed electrode "Böhler B-Elite 18" has a flux core. The results of tests on tensile strength, elongation, hardness, bending strength and bending angle of 12 mm. welded plates of 7 various St. 52 brands are reported. (C: .17-.24%, Si: .31-1.23%, Mn: .72-1.81%, Cr: .40-.42%, Cu: .31-.82%, Mo: .10-.93%). With the new electrode all the various plates gave good welds, assuming proper adjustment and skill of the welder. The electric arc must be short and the amperage rather low. An electrode 4 mm. in diam. at 150 amp. is best. In contrast to experiences with soft steels the bending angles of St. 52 joints with seam are lower than flush joints. It is remarkable that all flush samples broke in the weld, all samples with seam in the transitory zone between seam and plate. The new electrode could also be successfully used in welding overhead and in horizontal position. GN (11c)

Effect of New Welding Code on Process Industries. F. G. SHERBONDY. *Industrial & Engineering Chemistry, News Edition*, Vol. 10, Jan. 10, 1932, page 9. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 328. MEH (11c)

A New Field for Arc Welding. (Ein neues Arbeitsfeld für die Lichtbogenschweissung.) C. STIELER. *Elektroschweissung*, Vol. 3, Jan. 1932, page 11. Best results are obtained in combining casting and welding practice in building large machinery. In subdividing large castings in small parts, the single castings are sounder, no difficulties are apparent in joining them by welding by profiles and sheets. This is shown in a few examples, as foundation plates, large bearings, etc. GN (11c)

Welding in the New Zealand Government Railways Workshops. E. T. SPIDY & W. G. M. COLQUHOUN. *Welder*, Vol. 4, Sept. 1932, pages 3-8. A number of interesting applications of arc welding in the construction of 24 class "C" shunting locomotives, 2 compartment tank car and various repair jobs. TEJ (11c)

Designation of the Weld Seams in the Drawing. (Bezeichnung der Schweissnähte in der Konstruktionszeichnung.) W. SCHÜLLER. *Der Bauingenieur*, Vol. 13, Sept. 9, 1932, pages 472-474. The new symbols adopted in German welding technique as previously described by Hilpert (*Der Stahlbau*, Vol. 5, Aug. 5, 1932, pages 127-128) are critically discussed. It is shown that they need revision to a certain extent to make them more adaptable to welded constructions. Proposals are made for the preparation of international standards in welding technique. GN (11c)

The Span-Weld System. E. F. SPANNER. *Welder*, Vol. 3, July 1932, pages 2-7. The underlying idea of the span-weld system is the arrangement of stiffeners to diaphragms which are to be stressed at right angles to their planes in such a manner that there should be a line of minimum strength on that side of the neutral axis of the composite girder formed by the diaphragm plating which is remote from the diaphragm, in order to balance the line of minimum strength existing along the line of junction between diaphragm and web of stiffening member. This method is explained in full and the advantages consisting in greater stability and saving of material pointed out. Ha (11c)

Electrically Welded Steel Construction for the Freight Houses and Loading Platforms at Gütersloh, Germany. (Elektrisch geschweisster Stahlbau für die Güterschuppen- und Rampenanlage in Gütersloh.) W. SCHRÖDER. *Elektroschweissung*, Vol. 3, Sept. 1932, pages 165-170. Detailed description of construction and welding of the various structural parts, as girders, props, frames, purlins, etc. Total weight of the construction 240 tons. The saving of material for girders and props amounted to 18% against riveted construction. The price for 1 ton of welded construction was lower than price for a similar riveted construction. GN (11c)

Stainless Steel and Spot Welding. E. J. W. RAGSDALE. *Aviation*, Vol. 31, Apr. 1932, pages 177-179. Stainless steels are attractive to aeronautics largely because of their strength and corrosion-resistance characteristics. One of the main drawbacks to the use of this material has been the difficulty in fabricating airplane structural units from it. The diffculties coincident with the use of stainless steels in spot-welding are discussed, particularly corona effects. In the spot-welding process it is brought out that the mere fact that fusion has resulted does not necessarily indicate that a good weld obtains. Welds vary in character from being very brittle to dead soft. A weld having a high shear value lacks tenacity and is apt to snap while the soft one may be surrounded by a corona which spells failure by fatigue. A properly made weld of 2 thin plates of 18-8 material will permit of twisting one plate welded to another by at least 90° in the weld before the weld shears out of one of the plates, leaving a hole in that one and a plug on the other. The importance of the "weld recorder" is described. This machine records the total heat units dissipated in the flow of the welding current between the electrodes. With this device, not only has spot-welding been given the reliability of riveting, but it is cheaper, quicker, and demands less space. DTR (11c)

Recent Welded Steel Structures. (Neuere geschweisste Stahlbauten.) HANS SCHMUCKLER. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Feb. 6, 1932, pages 121-124. The construction details of a coal conveyor and tipple, an exposition hall and the widening and reinforcing of a bridge are described and illustrated. The welds have been tested by milling a little piece out of the seam and etching the spot. 10 references. Ha (11c)

International Congress on Bridge Building and Building Construction, Paris 1932. Report on the Session "Welding in Steel Construction." (Internationaler Kongress für Brückenbau und Hochbau in Paris 1932. Bericht über die dritte Arbeitssitzung "Schweissen im Stahlbau.") HANS SCHMUCKLER. *Elektroschweissung*, Vol. 3, Sept. 1932, pages 176-178. Includes discussion. The papers presented to the Congress are critically reviewed. They deal with welding of steel constructions, design of welded constructions, the practice of welding and coöperation of riveted and welded joints. The discussion particularly referred to dynamic stresses in such constructions. Preprints are obtainable from "Vereinigung für Brücken-und Hochbau," Zurich, Switzerland. GN (11c)

Facts on Welding with the Carbon Arc. (Erkenntnisse über die Schweissung mit dem Kohlelichtbogen.) S. SANDELOWSKY. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Feb. 20, 1932, pages 185-186. The electrical conditions of the carbon arc are investigated. Welding with the carbon arc is a real fusing of the 2 parts as only a minimum of metal is added. The ratio of area of seam to burned area is about 0.2, the ratio of height of seam about 0.1 for average currents and welding velocities. The deformations in this method of welding are smaller than with wire welding. It has not been found that carbon particles become imbedded in the weld. The weld shows a uniform structure, has a good appearance and had, for the steel ST 37, a tensile strength of 43 kg./mm.^{2} and an elongation of 15%. An eventual accumulation of O and N in the weld could be prevented by a reducing atmosphere. Ha (11c)

Auxiliary Tools for Welding Pipes. (Hilfsgeräte beim Schweissen von Rohren.) NARATH. *Die Schmelzschweissung*, Vol. 11, Aug. 1932, page 177. Tools, devices and templates required for welding a pipe line are described. Ha (11c)

How Power Plants can Promote Electric Welding. (Wie können die Elektrizitätswerke die weitere Verbreitung der Elektroschweissung fördern?) FR. MÖRTZSCH. *Elektroschweissung*, Vol. 3, Sept. 1932, pages 170-171. The paper shows the extensive applicability of electric welding in power plants, for new machines as well as repair work. GN (11c)

The Distribution of Stresses in Welded Joints under particular Consideration of Boiler Construction. (Ueber Spannungsverteilung in Schweissverbindungen unter besonderer Berücksichtigung des Kesselbaues.) H. W. NIES & KOCHENDOERFER. *Autogene Metallbearbeitung*, Vol. 25, July 15, 1932, pages 214-217. In a controversy over the advisability of placing straps over the welded seam to increase the strength of boilers it is maintained that the conditions are not yet cleared up enough to state with certainty their usefulness. Ha (11c)

The Standardization of Technique in Metallic Arc Welding. A. RAMSEY MOON. *Engineering*, Vol. 133, May 20, 1932, pages 589-593. Welding standards should include the following: standardization of welding materials, tests for determining the suitability of an electrode for the type of work at hand, outline of definite procedure for welding operation to control the quality of weld, rules of design. These factors are discussed at some length. 2 references. LFM (11c)

Classification of Locomotive Cylinder Welds. J. C. MILLER. *Welding Engineer*, Vol. 17, June 1932, pages 36-37. Gas welding is used for repairing broken cylinders by the Nickel Plate Road; the welding methods are classified according to whether the cylinders have to be removed from the frames or not. Details of the procedure are described. Ha (11c)

Electric Arc Welding in Machine Construction. (Die Lichtbogenschweissung im Maschinenbau.) KARL MELLER. *Die Werkzeugmaschine*, Vol. 36, Aug. 31, 1932, pages 301-303. The paper first discusses the difficulties which opposed the introduction of electric welding in machine construction. The economy is considered. The application was first limited to small parts, gradually cast machinery parts as pulleys, rope drums, bearings etc. were replaced by welded constructions. It is then shown in numerous examples how large pieces, such as machine frames, foundation plates, screw conveyors, brake-rings of large dynamos, etc. are to be welded efficiently. As an example of a totally welded machine that of housing and roll of a machine for making hard paper cylinders is discussed. GN (11c)

Arc Cutting of Metals. *American Machinist*, Vol. 76, May 19, 1932, pages 638-639. Information in the form of curves is given for cutting metal (cast Fe and steel) with the carbon or graphite arc. A current of 300 to 1000 amps. is required. The rate of cutting as dependent on thickness of material and depth of cut is shown in the curves. Ha (11c)

All-welded Building. *Electrical Review*, Vol. 110, March 11, 1932, page 378. Brief description of erection of a building at the Walthamstow, Eng., works of Murex Welding Processes, Ltd. MS (11c)

Better Welding Practice. *American Machinist*, Vol. 76, May 12, 1932, pages 618-620. The arc welding practice and progress made in its application to construction of naval vessels is summarized from papers read before the American Welding Society in New York. Tables and diagrams show relation of stress in fillet welds as function of welding temperature and length of weld. Ha (11c)

Five Welding Methods in One Shop. *American Machinist*, Vol. 76, Apr. 28, 1932, pages 545-549. Gas welding, flash butt welding, machine spot welding, gun spot welding and arc welding are used by the Seaman Body Corp. for welding automatic bodies. Methods of application in different parts described. Ha (11c)

Competent Welding of Duralumin and Zinc Plate. (Sachgemässes Schweissen von Duralumin und Zinkblech.) *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Aug. 10, 1932, pages 97-98. Practical hints are given for welding duralumin and Zn. For duralumin the use of welding rods with 5% Si is advisable. In oxy-acetylene welding Zn plate the use of welding torches is suggested so that the maximum acetylene consumption per mm. plate thickness amounts to .05 m.^{3}/hr. The excess of acetylene should be small. Zn sheets are better butt-welded with strips of the same material. Welding should not be interrupted. As flux a mixture of 50% sal ammoniac and 50% $ZnCl_2$ is best. After welding the piece should be heated to about 100° C., lightly hammered and then rapidly cooled. GN (11c)

Welded Steel Structures. *Electrical Review*, Vol. 110, May 27, 1932, page 774. Abstracts of a report on "British Practice in the Welding of Structural Steel Work" by James Caldwell and of several descriptive papers on welding practice in the Colonies, prepared for the International Association for Bridge and Structural Engineering. Chief attention is given to the first paper. Oxy-acetylene welding is used little in Great Britain for assembly and reinforcement of steel bridges, electrical welding being used. Heavy-coated electrode is favored. MS (11c)

Automatic Carbon Arc Welding. *Engineer*, Vol. 153, Apr. 29, 1932, pages 483-484. Description of machines made by the E. E. G. Electric Company, Ltd., London. A graph is given showing the consumption of filling wire, welding current, C and paper. Gives drawings of various types of C arc welds. LFM (11c)

Welded Repairs. *Engineer*, Vol. 154, July 15, 1932, page 70. Comments on methods of repairing broken machinery by welding, both electric and acetylene, used in the works of Barimor, Ltd., London. A weld can be made in Elektron metal, a Mg alloy, which will hold after the adjacent parent metal has been broken. LFM (11c)

A New Alloy for Copper Welding Rods. (Über eine neue Legierung für Kupfer-Schweissdrähte.) *Kali, Erz und Kohle*, Vol. 29, Sept. 10, 1932, page 145. For welding of Cu and its alloys Cu bronzes with 6-10% P are best fit, furnished in wires and strips. GN (11c)

Welded Truss Design. *Industry & Welding*, Vol. 4, Aug. 1932, pages 26-27. A few examples of welded trusses and joints and the savings in weight obtained over riveted construction. Ha (11c)

Discussion of Annual Meeting Papers, American Welding Society, New York, April 27 to 29, 1932. *Journal American Welding Society*, Vol. 11, July 1932, pages 5-16. Discussions of the following Papers: "Welding on U.S.S. New Orleans," J. O. Gawne, *Journal American Welding Society*, Vol. 11, April 1932, pages 9-22. "Welded Barge Construction at Federal Shipbuilding and Dry Dock Company," Gordon C. Holbrook, *Journal American Welding Society*, Vol. 11, April 1932, pages 5-8. "Cause and Cure of Intergranular Corrosion in Austenitic Steels," John A. Mathews, *Journal American Welding Society*, Vol. 11, April 1932, pages 23-27. "Spot Welding of Stainless Steel as Applied to Aircraft," Carl DeGanahl, *Journal American Welding Society*, Vol. 11, April 1932, pages 60-62. "Welding as Applied to the Electrolux Refrigerator," W. R. Campbell & R. S. Taylor, *Journal American Welding Society*, Vol. 11, April 1932, pages 48-52. "Welding of Extruded Bronze," Ira T. Hook, *Journal American Welding Society*, Vol. 11, April 1932, pages 42-46. "Pipe Welding for a High Pressure Steam Power Plant," E. B. Severs & W. P. Gavit, *Journal American Welding Society*, Vol. 11, May 1932, pages 10-12. "The Experimental Determination of the Values of Fillet Welds in Tension," Leon C. Bibber, *Journal American Welding Society*, Vol. 11, May 1932, pages 16-19. "A Study of the Transformation Points of Fusion Weld Metal," E. R. Hensel & E. I. Larsen, *Journal American Welding Society*, Vol. 11, April 1932, pages 28-32. "Machine Welding—Problems in Design and Operations," J. L. Anderson, *Journal American Welding Society*, Vol. 11, June 1932, pages 7-9. TEJ (11c)

Experimental Work on Welds. *Engineer*, Vol. 153, May 13, 1932, pages 527-528. **Inspection of Plant.** *Electrical Review*, Vol. 110, May 20, 1932, page 738. Abstract of section of the 1930-31 technical report of the British Engine, Boiler, and Electrical Insurance Co., Ltd. The following subjects are included: detection of defects in welded joints, welds broken in tension, resistance to shock, overhead and vertical welding, contour of fillet welds, use of bare wire in metallic arc welding of pressure vessels, heating of electrode, welded Monel metal, and atomic hydrogen process. MS + LFM (11c)

Spot Welding Enduro Stainless Steels. V. W. WHITMER. *Welding*, Vol. 3, Sept. 1932, pages 529-530; *American Metal Market*, Vol. 39, Sept. 9, 1932, pages 6, 8. A brief discussion of the variables in the spot welding operation with some pointers on spot welding stainless steel. Depressions at the spot can be reduced by using a Cu or Al block between the electrode and the sheet. Discoloration is removed by pickling or grinding and polishing. DTR + TEJ (11c)

Fusion Welding of Boiler Drums. *Steam Engineer*, Vol. 1, Sept. 1932, pages 529-530. Tests by Messrs. Babcock & Wilcox, Ltd., are described. AHE (11c)

Fusion Welding in Ship Building. (Autogene Schweissung im Schiffsbau.) *Zeitschrift für Schweisstechnik*, Vol. 21, June 1931, pages 126-129. The subject is treated as to: (1) scope of utilization; (2) nature of the welding operations; (3) preliminary work before welding; (4) welding rod; (5) manner of welding; (6) cost of seams; (7) weight of welded vessels; (8) required welding installations, and (9) general remarks. EF (11c)

Diesel Engine driven Ships with Fusion and Electrically Welded Hull. (Motorschiffe mit autogen und elektrisch geschweisster Schiffsschale.) *Schweizerische Technische Zeitschrift*, Vol. 29, July 27, 1932, pages 457-460. Detailed description of the work done in welding 2 ships for gravel transportation. GN (11c)

New Guiding Device for the Blow Torch of Fusion Cutting Machines. (Neuartige Steuerung des Brenners bei Autogen-Schneidmaschinen.) *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Sept. 10, 1932, pages 104-105. The cutting machine "Pantosec," built by the Messer Co., Frankfurt, is equipped with a guide wheel which permits operating the blowtorch in any direction. Previous methods are compared with the new method. GN (11c)

Welding of Cast Iron. (Schweissung von Grauguss.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 16, 1932, page 414. The paper considers the various methods of repairing castings by welding. GN (11c)

Welded Rolled Steel Design for the Iron and Steel Industry. CHRISTIAN A. WILLS. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 8-13. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 3, 1932. The author illustrates and explains the many advantages of substituting rolled steel arc welded construction for cast steel in equipment such as open hearth ladles, hot metal cars and ladles, various blast furnace parts, tin plate annealing boxes, lead pans and spelter boxes. The welded designs are lighter in weight and give better performance in service. TEJ (11c)

The First Welded Bridges in England. (Die ersten geschweissten Brücken in England.) WERNEKKE. *Der Stahlbau*, Vol. 5, Oct. 28, 1932, page 176. The first welded bridge in England was built on the Newcastle-Carlisle line of the London-Northeast railroad. Since this one proved successful several other welded bridges have been built. GN (11c)

Carbon Arc Welding. (Schweissen im Kohlelichtbogen.) F. SCHLESINGER. *Maschinenbau*, Vol. 11, Mar. 17, 1932, pages 128-129. Describes a new method developed in the welding plant of the Allgemeine Elektrizitätsgesellschaft which by use of the so-called "carbon welding head" eliminates the disadvantages of the original Bernardo principle: brittleness and hardness of the welds. A special paper rod in burning up during the welding operation absorbs the oxygen surrounding the arc and the weld. RFV (11c)

Riveting (11d)

Treatment of Duralumin Rivets. (Verarbeitung von Duralumin-Nieten.) *Aluminium*, Vol. 14, June 30, 1932, page 3. The heated and quenched rivets are kept in dry ice (solid CO_2) until needed, in order to avoid the hardening taking place at ordinary temperature if they are not used within 15 minutes after quenching which would make them unfit and require a new heat treatment. Ha (11d)

Coöperation of Rivet Joint and Weld Seam in Joints of Wrought Iron with Wrought Iron or Steel. (Über das Zusammenwirken von Nietverbindung und Schweissnaht bei Verbindungen von Schweisseisen mit Schweisseissen oder Flussstahl.) H. KAYSER. *Der Stahlbau*, Vol. 5, Sept. 16, 1932, pages 145-147. The results of tensile tests on riveted and welded joints of (1) wrought Fe plates with wrought Fe fish plates and (2) wrought Fe plates with steel fish plates (St. 37) are summarized and discussed. For the rivets St. 34.13 was used. The welds were made with d.c. and bare electrodes; there were no difficulties in welding. It is shown that in such combined riveted and welded joints rivets and weld seams coöperate. In inserting in the calculation the rivets with 2/3 of their effective bearing strength safety factors are obtained in such combined joints which are sufficient. GN (11d)

Flow of Stresses in Riveted Joints. (Kraftfluss in Laschenverbindungen.) EBEL & REINHARD. *Die Wärme*, Vol. 55, Apr. 9, 1932, pages 221-232. Tests were performed to throw light upon the flow of stresses in riveted joints of steel. Studying the elongation conditions on special rubber models, the decrease of the total elongation in comparison with a plain, unlashed body was established as well as the irregular course of local stretching in both the direction of flow and perpendicular to the wall. The irregular course of elongation is given for various wall thicknesses and it is proved that, irrespective of the effect of riveting, the static maximum load is located where the sheet planes are in touch with each other. Checking the experimental results on riveted joints of Fe it is shown that the data gained on rubber models can be applied to riveted joints. EF (11d)

Rivets in Shipbuilding. ROBERT BOARDMAN. *Engineer*, Vol. 153, May 27, 1932, pages 590-592. From paper read before the North-East Coast Institution of Engineers and Shipbuilders. Discusses choice of material, design of rivets, preparation of the work and methods of riveting. LFM (11d)

Rivet Joint on Bending Girders. (Nietanschluss von Biegeträgern.) E. GABER. *Der Bauingenieur*, Vol. 13, Oct. 21, 1932, pages 539-542. The rule according to which in joining bars the rivets are to have the same strength as the joined effective cross-section also holds true in joining bending girders. A calculation method is described for various types of rivet joints that are to take up bending moments. GN (11d)

On the Resistance to Slippage and Temperature Increases in Riveted Joints which are often subjected to Periodical Loads. (Über den Gleitwiderstand und über Temperaturerhöhungen in Nietverbindungen, die oftmals wiederkehrender Belastung unterworfen wurden.) O. GRAF. *Stahlbau*, Vol. 5, June 24, 1932, pages 99-100. In carefully made riveted joints (plates St. 37, rivets St. 34) the resistance to slip affects the stress distribution in such a manner that, at permissible loads, the maximum strain is apparent not in the cross-section of the hole but in the plate. Therefore, in endurance pulling tests with the load changing from zero to maximum, fracture occurs before the rivet hole. From such tests it is to be concluded that the resistance to slip in rivet joints which are frequently subjected to periodic tensile loads is a favorable factor. The loads were changed in the tests 350 times/min. Temperatures were measured during the tests. The temperature increases are due to the friction in the pressed surfaces, bending of the rivets, etc. The temperature increases first rapidly, then is constant for a longer or shorter time, and later increases again before fracture. GN (11d)

WORKING OF METALS & ALLOYS (12)
Casting & Solidification (12b)

Practical Experience gained on Permanent Chill Casting of Copper Alloys. (Praktische Erfahrungen beim Dauerformguss von Kupferlegierungen.) E. BECKER. *Die Metallbörse*, Vol. 22, May 14, 1932, pages 609-610; May 21, 1932, pages 641-642. The metallurgical reasons accounting for the superior properties of chill cast Cu-Sn alloys and Cu-Pb-Sn bearing metals are given and substantiated by a table of the physical properties of these alloys in the sand and chill cast state. The disadvantages mainly ascribed to the considerable inclosure of gases and the rapid cooling conditions as well as the uncertain shrinking properties are pointed out. The writer urges a casting temperature 30°-50° C. higher than used for sand castings. Stress is laid on a proper deoxidation. The defects due to casting at too high and too low temperatures and due to too rapid and too low casting speeds are discussed. Bottom casting is strongly advised and the reasons therefore are given. Exceptions are specified. The salient features of permanent molds are pointed out and up-to-date examples are illustrated and described at length. Cast iron molds of 3-3.5% C, 0.8% Si and 0.4% P rendered good service besides pearlite cast iron and Cr-Ni bearing cast iron. The heat dissipation should be such that the temperature of the mold does not exceed 400°-450° C. The acceleration of the heat dissipation by special devices on the mold shell is favored, while the disadvantages of compressed air, water and oil cooling are criticized. Instructions regarding the avoidance of local heat accumulations, warping of molds, venting, and handling of iron cores are furnished. Protective coatings of a mixture of clay, soapstone talc with Na-silicate, paraffine, lubricating oil and graphite or soot are advised. With a thorough mixture, 200-300 castings are made. Soap solutions with molasses additions adhere tightly, but the use of coal tar oil, and atomizing of explosive petroleum + lamp black should be avoided. EF (12b)

Practical Experiences in Processing Centrifugal Castings of Non Ferrous Metals. (Praktische Erfahrungen bei der Herstellung von Schleuderguss aus N.-E. Metallen.) ERICH BECKER. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 55, July 24, 1932, pages 291-294; Aug. 7, 1932, pages 311-312. The paper first gives a general survey of the points to be observed in making centrifugal castings and stresses the importance of proper rotation speed, suitable molds, casting temperature and cooling speed. Structure and properties of a large number of non-ferrous alloys cast by the centrifugal process are discussed. A detailed outline of the horizontal centrifugal casting process and means to avoid formation of gases and oxidation are given. Mold materials and mold coatings are dealt with. Products made by the horizontal casting process are enumerated. The 2nd part considers the vertical casting process which is particularly used for casting gears. Casting machines for this purpose are shown, as well as a new device for casting brake linings. The increased resistance to abrasion of centrifugal castings is pointed out. The favorable effect of centrifugal casting on the mechanical properties of a few alloys is gained from the following table:

Material	Sand casting Tensile strength lbs./in.²	Sand casting Elongation %	Centrifugal casting Tensile strength lbs./in.²	Centrifugal casting Elongation %
Red brass Rg 5	17100	9	49800	27
Special brass DIN 1709	61200	24	72500	32
Brass 63 Cu	45500	22	65400	34
Al	18500	10	29900	18
P-bronze	28400	10	48400	21
Monel metal	.....	....	97900	3
Monel metal 3.09% S.	.....	....	112600	8

GN (12b)

Sheaves of Brass made by the Green Sand Method. (Messingwandscheiben im Nassgussverfahren.) R. BERGER. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 30, 1932, pages 435-436. The author discusses various causes of failures from molding to casting. GN (12b)

Metal Press Casting. (Metallpressguss.) JOHN MEHRTENS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Sept. 11/18, 1932, pages 382-384. A historical survey on the development of press casting is given, the main results of investigations by Kaufmann, Frommer, Uhlmann, Peter, Pack, etc., are reviewed. The advantages of the press casting method are dealt with with special reference to the mechanical properties and costs. A few data are given in the table below:

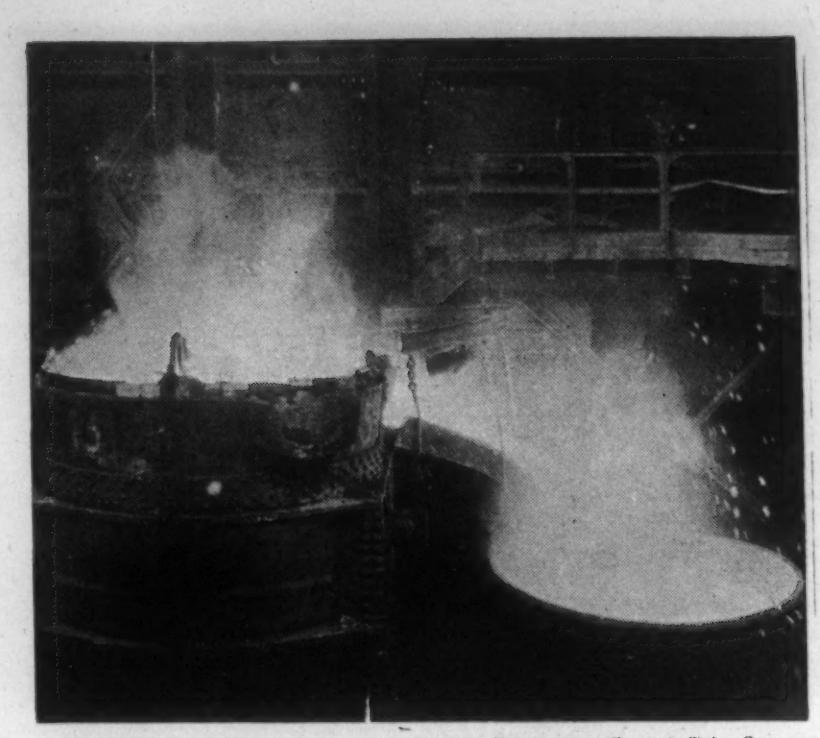
Brass 58% Cu	Tensile Strength kg./mm.²	Elongation %	Brinell hardness
Sand casting	17.7	4.7	74
Press casting	22.7	8.0	79
Pressed parts	45.4	27.0	93

There have been found in press castings of similar composition still higher tensile properties, tensile strengths up to 35 kg./mm.², elongation 18%, hardness 85. It is finally emphasized that press casting can hardly be dispensed with in improving in mass production the quality of Cu alloys. (12b)

The Solidification and Crystallization of Steel Ingots.—Effect of Casting Temperature and Supercooling Property of the Steel. (Die Erstarrung und Kristallisation der Stahlblöcke sowie ihre Beeinflussbarkeit durch die Giesstemperatur und die Unterkühlungsfähigkeit des Stahles.) BERNHARD MATUSCHKA. *Archiv für das Eisenhüttenwesen*, Vol. 6, July 1932, pages 1-12. Report 232 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. In the steel industry progress during the past year has been in the direction of higher quality steel through a rise in the uniformity of production. The degree of uniformity for the most part is determined by the structure of the cast ingot. Ingot crystallization and liquation play major roles. The author divides solidification conditions into external and internal ones. The dimensions and condition of the mold constitute the external conditions, while the physical and crystallographical properties of the steel regulate the internal conditions of solidification. The writer made a series of tests in 2 different molds under varying casting temperatures observing the structure of the casting for different alloy steels, and summarized that solidification and crystallization of steel ingots are a wholly regular process. The external conditions are given by the regular heat transfer from the ingot through the mold. The internal conditions determine the type and manner in which the crystallization progresses within the casting for a given heat transfer through the mold. These 2 factors are primarily affected by the casting temperature and the supercooling property of the steel, as well as by chemical composition and physical properties of the material. Low casting temperatures and maximum degree of deoxidation, gas removal, slag purity and alloying tend to yield finer primary crystallization and little liquation, which in turn give improvement in quality through maximum uniformity. 20 references. DTR (12b)

A Method for Study of Shrinkage and its Distribution in Castings. N. B. PILLING & T. E. KIHLGREN. *Transactions American Foundrymen's Association*, Vol. 3, July-Aug. 1932, pages 201-216. An unfed test casting was adapted for quantitative measurement of specific weight at the freezing point, linear shrinkage and solidification shrinkage. The shrinkage constants of several casting alloys are given, including Cu, brasses, bronzes, Al, Ni and Ni alloys, C steel and Ni-resist iron. A method for revealing capillary shrinkages in a sectioned casting is described which involves charging the voids with saturated ferrous sulphate or ferrous ammonium sulphate and expelling it against a sheet of paper sensitized with potassium ferricyanide. CHL (12b)

Technology of Foundry Processes, VIII. The Production of Castings in Dies and Long Life Molds. G. S. SCHALLER. *Western Machinery World*, Vol. 22, Apr. 1931, pages 186-188. Die castings and centrifugal casting methods are discussed quite generally. Ha (12b)



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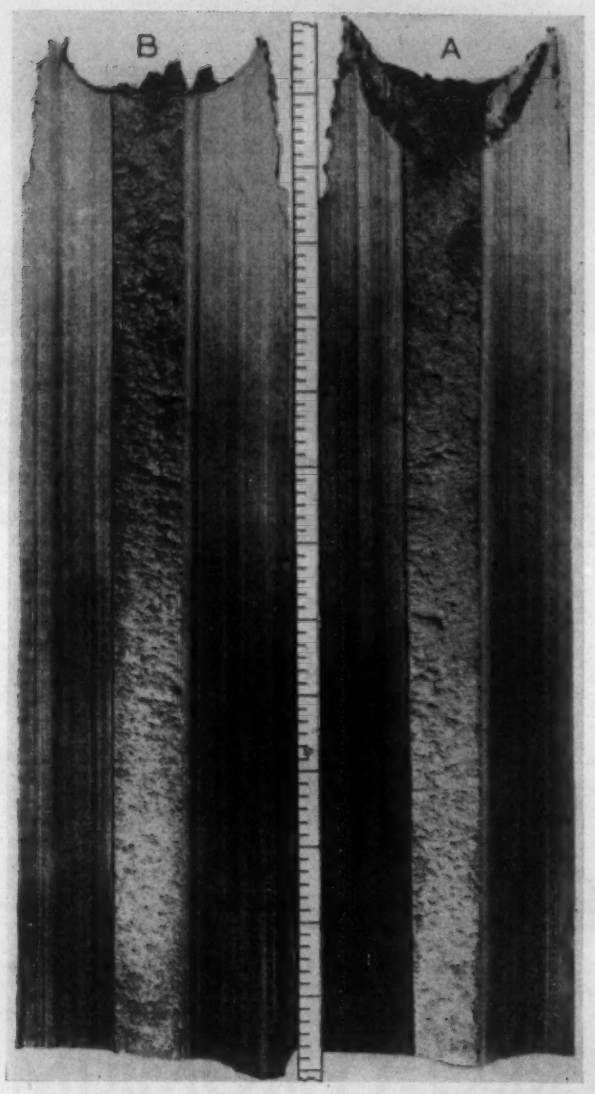

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Mould Materials for Non-ferrous Strip Ingot Casting. G. L. Bailey. *Institute of Metals, Advance Copy* No. 605, Sept. 1932, 24 pages. Molds for casting non-ferrous metals are most frequently made from gray cast Fe. A series of experiments with 70-30 brass indicated that "blowing" (evidenced by porous structure of surface of ingot) was due to a reaction between the oxide coating of the cast Fe and Fe_3C in the Fe. Blowing results when the surface of the mold reaches a certain temperature, as when the stream of molten metal impinges on the surface. It is not observed with mild steel or Cu molds. By heating cast Fe in vacuum and measuring the amount of gas evolved it was found that blowing occurred only when the temperature exceeded 700° C. Temperature gradients in the molds were determined. When the stream of brass at 1100° C. impinged on the surface of the mold the maximum surface temperature was approximately 800° C. When the stream cleared the surface the temperature rose to only 500° C. Mild steel molds warped badly. Measurement of the temperature gradients indicated that the warpage was due to the rapid rise and fall of the surface temperature. Cast Fe checks instead of warping. Warping can be minimized by using either a relatively poor conductor with a high yield point at elevated temperature or a good conductor with a vanishingly small yield point. A heat-treated Ni-Cr-Mo steel served for the former material and Cu for the latter. Neither warped nor caused blowing. The bars welded to the steel mold in spots and it was necessary to aluminize the surface to prevent sticking. A Cu mold 1½" thick was satisfactory for casting ingots 1" thick. A water-cooled mold of thinner Cu was also satisfactory. The crystal structure of the ingot varied little with the mold material. Cu was considered to be the best material for strip-ingot molds. JLG (12b)

Balancing of the Tubular Molds for Centrifugal Casting Machines. (L'Equilibrage des Moules à Tuyaux pour les Machines à Couler Centrifuges.) W. Saran. *Revue de Fonderie Moderne*, Vol. 26, June 25, 1932, pages 199-203. The different methods of balancing the rotating molds in the De Lavaud and the Moore process of centrifugal casting are described in detail. Ha (12b)

Pouring of Bearings. (Ausgiessen von Lagern.) *Die Werkzeugmaschine*, Vol. 36, Sept. 15, 1932, pages 317-318. Advantages of a complete mechanization of the pouring process are discussed. Maintenance of proper casting temperatures is emphasized. Proper foundry equipment is stressed. Causes of the running out of bearings are discussed. GN (12b)

Chilled Composite Cast Iron Rolls. (Hartguss- Verbundwalzen.) K. Ho. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, May 15, 1932, pages 198-199. The difficulties in making compound rolls are considered. The method of using a partition sheet for keeping apart the 2 metals offers disadvantages. The following procedure is much better: The cast tough core of the roll is placed into the mold, gradually heated by an induction current so that the mold dries; when the temperature of the core is sufficiently high the case is cast. For this method the iron commonly used for chilled parts is unsuitable. It is better to use a high C cupola iron which has been decarbonized in an electric or crucible furnace, superheated and alloyed with Fe-Cr-Ni. The composition of the finished roll should not amount to more than 2.5% C, 10-18% Ni, 6-15% Cr, and 1-2% Si. Rolls thus processed show a better surface hardness, higher resistance against heat and wear. Machining offers no difficulties. GN (12b)

Ingot Casting Practice can Improve Quality of Steel. Emil Gathmann. *Steel*, Vol. 90, Mar. 28, 1932, pages 34-35; *Rolling Mill Journal*, Vol. 7, No. 1, pages 59-60, 66-67. Abstract of a paper presented before the New York Chapter of the American Society for Steel Treating, Mar. 21, 1932. The author shows that naturally occurring defects in ingots such as piping, axial porosity, segregation, non-metallic inclusions, cleavage planes, scabs and blisters may be controlled and eliminated by the use of a degasifier, a relatively high tapping temperature, a relatively low pouring temperature, correct mold design and the use of big-end-up molds. MS + JN (12b)

Casting of Pipes in the Plants of America and USSR. A. A. Bulgakov. *Domez*, No. 3-4, 1932, pages 33-46. (In Russian). A detailed description of the equipment and methods of working used at Bessemer Plant of the United States Pipe and Foundry Company. The factors involved are critically examined from the standpoint of efficiency, and suggestions are made regarding possible improvement. Coshocton, Ohio, plant of James B. Clow and Sons is given as a model organization. The paper includes the complete description and drawings of the projected pipe casting plants in Russia. (12b)

Some Common Failures of Steel Pouring Refractories. R. H. Stone. *Blast Furnace & Steel Plant*, Vol. 20, June 1932, pages 515-518. After perfect pour, if a graphite stopper head and clay nozzle were used, head will probably be nearly the original shape, while nozzle will show a concave seat the shape of the head. If both are of clay, head will be concave sided and nozzle, convex. Much of head will likely be washed away, exposing end of steel stopper rod, requiring an extensive repair. After a good pour, stopper pin will be found to be melted. This indicates that too much heat has been transmitted to the pin and head or it has not dissipated rapidly enough up the rod. This melting may be prevented by thickening graphite head; decreasing its conductivity; making pin and rod heavier; and providing thicker sleeve brick. Difficulty in opening usually occurs with hot heats when clay stopper heads are used and when a skull has formed in the well. Case of a good shut-off at the start followed by a dribble which usually increases may be due to failure or washing away of the nozzle faster than the head can reform the seat; cutting of grooves in the head by O_2 torch; head being forced down on a small skull in the well; and excessive washing away of the nose resulting from a deep and narrow well. Dribble during pouring of first few ingots indicates a skull in the well or poor original contact between head and nozzle. Good pouring at start followed by slight dribble for a few molds and then good shut-off for balance may be due to irregularities in softening of the nozzle causing dribble to start. After several shut-offs such irregularities wear off, stopper and nozzle become adjusted and give good shut-off again. It is believed that a head with a tapered nose gives better results than a blunt nosed head. MS (12b)

Rolling (12c)

Effect of Controlled Cooling and Temperature Equalization on Internal Fissures in Rails. C. P., O. F. A. & N. P. P. Sandberg. *Metals & Alloys*, Vol. 3, Apr. 1932, pages 89-92. The authors discuss the phenomena occurring in steel during cooling as they may contribute to "shatter cracks." Features emphasized are strength and ductility differences at different temperatures, temperature differences that may occur in masses of steel cooling from forging of rolling temperatures, particularly rails, and the rates of contraction. It is pointed out that the rigid outer layers may be strongest and exert their greatest restraint on the contraction of the hot interior just at the point when due to its temperature it has the least strength and/or ductility. From these theoretical considerations the authors have devised an oven or equalization chamber built on the hot bed of rail mills in which the temperature of the entire section of the rail is equalized before permitting it to cool through the most dangerous temperatures and subsequently cooling it through this range at a retarded rate. WLC (12c)

Recent Developments in Boiler Engineering. *Engineer*, Vol. 154, July 29, 1932, pages 109-110. Describes new seamless rolling method for high-safety boiler drums used at the Thyssen Works of United Steel Works at Mulheim-Ruhr, Germany. A continuous rolling process is used replacing the forging process. This process is based on the work of M. Roeckner who invented a radial rolling mill for rolling out hollow ingots to long drums of large diameter. After these drums are closed they can be subjected to excess pressure tests and annealed in the same way as welded drums. Seamless drums can be made of harder steels and steels of relatively higher alloy content than welded or riveted drums. LFM (12c)

Regulation of Speeds of Auxiliary Contrivances in Modern Roughing Mill Stands. (Bemessung der Geschwindigkeiten für de Hilfseinrichtungen neuzeitlicher schwerer Blockstrassen.) ERICH HOWAHR. *Stahl und Eisen*, Vol. 52, July 21, 1932, pages 701-706. Report 95 of Rolling Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. The paper takes up the problem of a certain continuous rolling mill in which a production of 1,200,000 tons was required for a year of 6700 operating hours. The rolls were 1100 mm. in diam. and 2500 mm. long. 7-ton and 5-ton ingots or blooms were to be rolled into slabs 300 mm. x 300 mm., a total of 13 passes to be used for each size ingot. For each size tables are given of the rolling plan, showing the motor speeds, time required for each pass, time required for intermediate lift and fall and other motions, etc. The total time allotted for one 7-ton bloom was 83 sec., 38.6 sec. actually consumed in the 13 passes and 44.4 sec. used for the other motions. Yearly production at this rate is estimated at 1,970,000 tons. For the smaller size, 87 sec. total time is required, which gives an estimate of 1,380,000 tons/year. Diagrammatic sketches illustrate travel of material through passes in roughing mill. DTR (12c)

Stay Bolts with Rolled-on Screw Threads for Locomotive Boilers. (Stehbolzen mit gewalztem Gewinde für Lokomotivkessel.) AMMERMANN. *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 87, Aug. 1, 1932, pages 288-291. The maintenance expenses for locomotive boilers are increased 22% by stay-bolts which are the source of many troubles in the Stephenson Boiler. The efforts to secure a suitable stay bolt thread are reviewed. Attention is called to the utilization of cold rolling for the manufacture of Cu stay bolts. The requirements to be met with are listed and the author's novel machine designed in coöperation with the J. G. Kayser A.G., Nuremberg, is illustrated and described. The output is 20-22 pieces per min., i.e. 1/15 of the time required on the lathe. The rolling on of the screw thread is associated with 20% savings in material. The strength of the rolled screw thread is materially greater. Micro-photographs are shown which demonstrate the finer grain in the central parts of the screw core and the cleaner surface in the thread due to rolling. However only those brands of Cu can be used which meet the greater stresses of cold deformation. The various operations of the novel manufacturing process are fully outlined. EF (12c)

Metal Rolling in Mass Production. JAMES R. CORNELIUS. *American Machinist*, Vol. 76, Apr. 28, 1932, pages 556-558. The principles involved in cold rolling for finishing processes and hot rolling for making of seamless tubes are briefly explained and practical applications illustrated. Ha (12c)

The Influence of the Manufacturing Methods of Seamless Tubes on Their Quality. (Der Einfluss der Herstellungsverfahren nahtloser Rohre auf ihre Qualität.) K. ADLOFF. *Die Röhrenindustrie*, Vol. 24, May 21, 1931, pages 121-122; July 2, 1931, pages 160-162. In the introduction the history of making seamless tube products is reviewed with particular reference to the chemical composition. Then the principal manufacturing methods of seamless tubular steel products are discussed including the "Pilgerschritt" and Mannesmann Rolling Mills, the disc rolling mill and the press-drawing combination method according to Ehrhardt. The next chapter discusses the experiences gained on different boiler materials and tabulates the physical properties of 10 more important steels. The fourth chapter is devoted to the creep of seamless tubes, and tensile strength data of a 0.15 C and a Cr-Ni-Mo steel are plotted against the log. nat. of creep between 400 and 600° C. Further sets of curves refer to the effect of creep on the distribution of stresses. The fifth chapter pertains to the detection of defects and to the various testing methods therefor. EF (12c)

Application of Small Roll Diameter and Progress in Multi-Roll Rolling Mills. (Anwendung kleinster Walzendurchmesser und Fortbildung von Mehrrollenwalzwerken.) WILHELM ROHN. *Stahl und Eisen*, Vol. 52, Aug. 25, 1932, pages 821-825. In the cold rolling of sheets and strip below 3 mm. thick, the conditions for cold working the material became more favorable, the smaller the diameter of the rolls used. This is apparent from the sagging or deflection of the rolls and from their gripping properties. The author gives a mathematical discussion with respect to these 2 factors and illustrates the well-known faulty wave-like surface of cold-rolled sheet or strip when the rolls are ground too concave or too convex. When the rolls are properly protected against sagging or deflection it is possible to make higher cold roll reductions in each pass through the rolls. In the 4-roll sheet mills, in which the working rolls are protected against sagging in a direction perpendicular to rolling direction, the diameter of working rolls is decreased from 200 mm. in the 2-high strip mill to approximately 80 mm. In the 6-roll mill, in which is provided protection against sagging in directions both parallel and perpendicular to rolling direction, the diameter of the working rolls may be lowered still further down to 25 mm., 60 mm. long. In this case the supporting rolls run about 55 mm. in diameter. In this 6-roll mill it is possible to cold roll Fe, Ni, or Cu strip, 35 mm. wide, without any intermediate anneal, as follows: 0.5, 0.35, 0.2, 0.12, 0.07, 0.05, 0.035, 0.03, 0.026, 0.023, 0.020 mm. Finally, a 12-roll strip mill is described in which the diameter of the working rolls is only 10 mm., intermediate rolls 20 mm. and outer supporting rolls 40 mm. In this mill Fe and Ni strip could be cold rolled down as follows: 0.5, 0.25, 0.1, 0.045, 0.025, 0.015, 0.01 mm. It is seen that the same amount of cold work (0.1 to 0.025 mm.) is done in 2 passes in the 12-roll mill as is done in 5 passes in the 6-roll mill. Furthermore, the working rolls in the 12-roll mill with a scleroscope hardness of 85 held up just as well as those with scleroscope of 95 in the 6-roll mill. The design, arrangement, cooling and relative costs of these multi-roll mills are discussed. DTR (12c)

Automatic Electric Screwdown. RALPH H. WRIGHT. *Blast Furnace & Steel Plant*, Vol. 20, July 1932, pages 588-589, 592. Automatic screw-down equipment may be either of the preset or follow-up types. In former, succession of roll settings for an entire rolling schedule is determined in advance. The particular schedule can be repeated indefinitely. Changes in screw-down setting may be initiated by an operator by means of a push-button or pass-selector switch, or they may be made entirely automatic by using light relays or other devices activated by movement of the metal or mill. Preset type is applicable to 2-or 3-high mills for rolling plates, beams, sheets and similar products. Principal elements are a limit switch with plugs or stops for setting up the schedules, a pass-selector switch or push-button station, special screw-down motor, and automatic contactor panels. Follow-up system permits making accurate hand adjustments from a remote point. It may be applied to screw-downs, shear gages and similar devices where accuracy and flexibility are required but when hard and fast schedules of adjustments cannot be followed. Equipment usually consists of a master dial, graduated to represent range of adjustment of device under control, and automatic control which causes the device to assume setting indicated by position of master dial. MS (12c)

Continuous Rod Mills. (Rein kontinuierliche Drahtwalzwerke.) *Demag Nachrichten*, Vol. 6, July 1932, pages C17-C18; *Demag News*, Vol. 6, July 1932, pages C17-C18. Brief illustrated description of a new German rod mill, processing 140 tons of 5 mm. rod/8 hr. shift. GN + Ha (12c)

Sheet and Semi-Product Rolling Mill for the Utilization of Scrap. (Feinblech- und Halbzeug- Walzwerk für die Verwertung von Schrott.) *Demag Nachrichten*, Vol. 6, July 1932, pages C21-C24; *Demag News*, Vol. 6, July 1932, pages C21-C24. Detailed description of a 3-high merchant mill and a sheet mill so built as to permit not only the use of secondary material such as used wheel rims, rails, axles, scrap plates, etc. but also the use of billets and small ingots produced in the adjacent electric steel mill. GN + Ha (12c)

Electric Rolling Mills. *Electrical Review*, Vol. 110, June 10, 1932, page 836. Describes electric drives and auxiliary equipment of the Courtybella Works of the Whitehead Iron & Steel Co., Ltd., at Newport, Monmouthshire, Eng. Mills roll 30 ft. round or square bars from ⅜" to 2¼", and flats from 1½" to 6". There are a 12" continuous tube-strip mill, cold-rolling mills, and a 12-14" semi-continuous bar mill. MS (12c)

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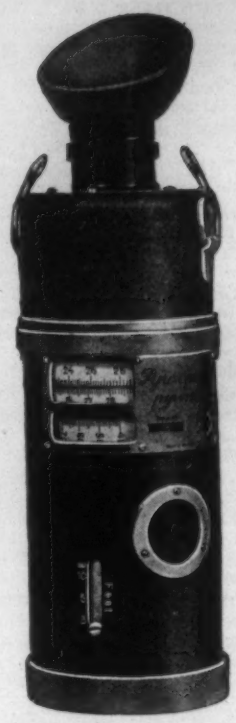

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Electric Roll-Heater for Fine Sheet Rolling Mills. (Elektrischer Walzenheizer für Feinblech-Walzwerke.) *Elektrotechnische Zeitschrift*, Vol. 53, July 14, 1932, pages 684-685. A framework containing heating elements are laid around 2 rolls; the elements are strips arranged parallel to the rolls, they are connected to 380 volts 3-phase or 220 volts direct current. The time of heating is 8 hours so that it can be done over night for the shift beginning in the morning. Ha (12c)

Automatic Control of the Rolling Mill. *Rolling Mill Journal*, Vol. 7, No. 1, 1932, pages 31-32. In one mill, steel is moved automatically from furnaces to first stand of finishing rolls. Steel passing by a flag switch starts run-out table and when tail end of steel passes this switch, table is slowed down. On passing a second flag switch, table is stopped by dynamic breaking and a magnetic break, and cross travel chain is started up, transferring steel in front of first roll stands. In a second case, automatic control is applied to a double hot-bed installation which is divided both mechanically and electrically into 2 equal sections so as to permit individual operation of each section or as a single coupled unit. One operator manipulates the 21 separate motor drivers involved. MS (12c)

Improved Cooling Beds for Merchant Mills. *Iron & Coal Trades Review*, Vol. 125, July 29, 1932, page 161. Describes some German installations of cooling beds for mills which roll several rods simultaneously. Ha (12c)

An Investigation on Alloy Chilled Rolls. KOHEI TANIGUCHI. *Tetsu to Hagane*, Vol. 18, Sept. 1932, pages 952-980. In an investigation of the characteristics of steel mill chilled rolls, many usual testing methods for common cast irons were shown to be unsuitable for chilled rolls, owing to the remarkable difference in their properties. So the present experiments were carried out utilizing a proper method devised by the author. Influences of various elements upon the surface hardness which are so important for chilled rolls were systematically investigated. At first, 3 kg. of the cast iron containing 3.11% C, 0.58% Si and 0.57% Mn were melted and 15 elements, (A group) C, Al, Si, P, Ti, Co, Ni, Cu, (B group) S, V, Cr, Mn, Mo, Sn, and W were added each in various percentages and cast in an iron mold, about 130 x 70 x 100 mm., from 1280° C. after keeping at 1500° C. for 15 minutes. The surface hardness of these chilled specimens were tested by Shore's scleroscope, and the results obtained are shown in Fig. 1 graphically. As clearly shown in this figure Ni is most effective to gain a hard roll. According to an investigation of influence of these elements upon the depth of chill, the elements belonging to group A have tendency to decrease the depth, while those of group B to increase, as shown in Fig. 2. We can see in the figure that a small amount of Cr is most effective in increasing the depth of chill. In view of the above results, various effects of Ni and Cr and also combined effects of them on chilled rolls were again further studied, that is the hardness, depth and micro- and macro-structures of chilled part, and strength, hardness, and impact resistance as well as

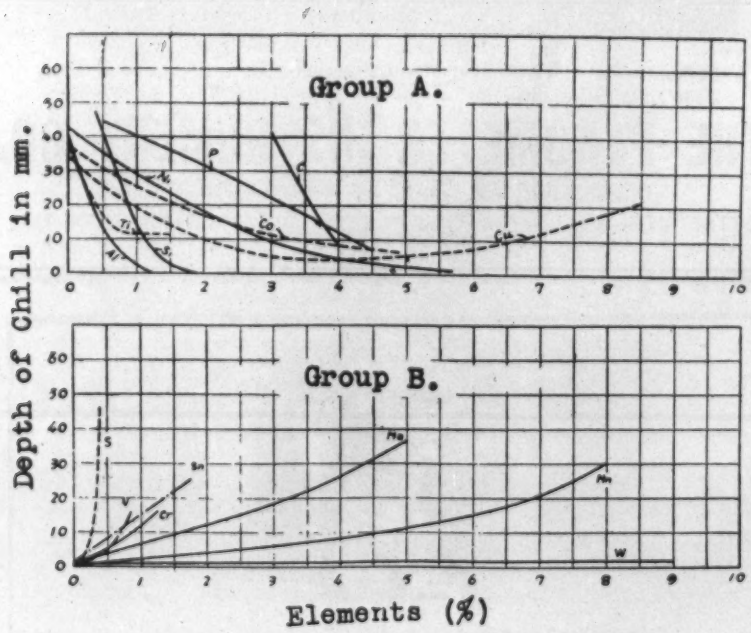


Fig. 1

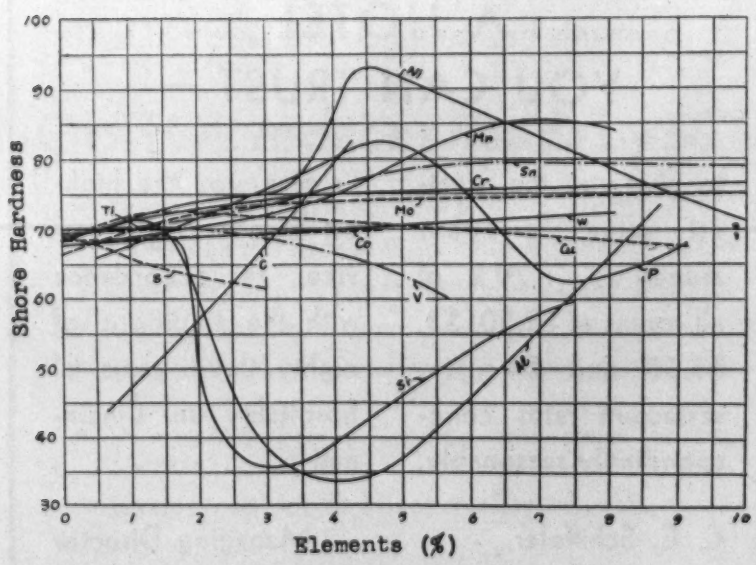


Fig. 2

micro- and macro-structures of the inner gray part were tested. At last the present author discovered a very hard and strong alloy chilled roll, composition of which lies between 3.3-4.3% Ni and 1.2-1.6% Cr, and its surface hardness over 90 in scleroscope number, with a constant chill depth equal to plain cast iron chilled rolls. This kind of heavy rolls have been practically made and used as Sn plate finishing rolls (weight of one roll is 3,800 kg.) or thin sheet finishing rolls (weight of one roll is 5,717 kg.), etc., for several years showing results beyond expectation. TS (12c)

Forging (12d)

Experiments to Determine the Energy Necessary in Drop Forging. (Versuche zur Ermittlung des Arbeitsbedarfs beim Gesenkschmieden.) M. ZSCHEILE. *Maschinenbau*, Vol. 11, May 5, 1932, pages 177-181. The experiments were to test and extend the published theories on plastic deformation. Also they were to give a base for determining the time and mechanical energy employed for a finished piece in drop forging. It deals with all kinds of shapes. Author was successful in predetermining necessary energy with sufficient accuracy. 13 references. RFV (12d)

Chipless Shaping of Metals. (Spanlose Formung der Metalle.) G. SACHS, W. EISBEIN, W. KUNTZE & W. LINICUS. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft 16, 1931, pages 1-127. Chipless shaping is defined as that procedure by which the change of shape of a metal is effected by the plasticity of the material. The most important shaping processes are upsetting (forging and pressing), extruding, deep-drawing. The requirements of the tools for these processes as regards material and shape, the shaping in cold or hot state and the limitations of deformation are discussed and the different processes dealt with theoretically. Tests were made on duralumin, Cu, brass, soft Fe and Sn with differently formed punches (cylinder, sphere and cone), and equations derived showing the hardness values under consideration of friction and pure pressure resistance of the tool. The tests are reproduced in detail and illustrated by etchings. For the numerous details the paper must be referred to, particularly for the discussion of the flowing phenomenon and the determination of friction and energy consumption. See also *Metals & Alloys*, Vol. 2, Sept. 1931, page 183. Ha (12d)

Extruding (12f)

Impact Extrusion of Aluminum. HERBERT H. HALL. *American Machinist*, Vol. 76, Aug. 17, 1932, pages 925-928. The impact extruding process consists in compressing a thick, flat slug of annealed Al with such force that the metal is forced upwards around the die or punch; many shapes impossible to obtain in the drawing process can be formed in this way. Al is particularly well adapted to this method of working. Many illustrations show different products which can be given attractive finishes by polishing, enameling, lithographing or coloring. Ha (12f)

Machining (12g)

Testing the Machinability of Brass. (Bearbeitungsprüfung von Messing.) E. GUTTMANN. *Werkstattstechnik*, Vol. 26, July 15, 1932, pages 273-278. Turning, piercing and sawing methods are discussed. A new electrical device for checking the power used in these processes is described. It is similar to that of Peters and Johnston and to Sieman's. The thus determined values of the main cutting pressure of turning various ferrous and non-ferrous alloys are demonstrated in diagrams. In cutting parallel to the axle of the shaft, the best results were obtained by measuring the pressure at the lathe; in cutting perpendicular to the axle, by the sawing test. In both of these tests, differences of results on various materials or on the same material under different conditions are very distinct. RFV (12g)

Chromium Plating Cutting Tools Multiplies their Wear-Life and Saves Many Man-Hours. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 66, May 1932, pages 748-751. Only 3 years ago Cr plating was not the controlled process it is today. Even large industrial installations were few, and were installed under careful supervision of the highest trained men. Today the art is so advanced that a compact Cr-plating setup may soon be available in any plant. An increase in life of 22 times has been shown for Cr-plated drills, while the life span of reamers is said to have increased about 25 times by Cr-plating. The most successful applications of Cr-plated tools have been in the cutting of non-metallic materials, non-ferrous metals, and cast Fe. A typical list of the known types of tools, showing the range of application, is enumerated. DTR (12g)

Spicer Develops Production Method for Strong, Light Axle. ATHEL F. DENHAM. *Automotive Industries*, Vol. 67, Sept. 17, 1932, pages 364-365. Outline of Spicer method for producing strong, light axles. DTR (12g)

Cylinder Refinishing by "Fine-boring Method." (Zylinderbearbeitung nach dem Feinbohrverfahren.) F. FRITSCHE. *Deutsche Motorzeitschrift*, Vol. 9, Mar. 1932, pages 56-60. The article discusses the latest advances in cylinder boring with respect to small feeds and high cutting speeds, which method aims at a less pronounced destruction of the cylinder wall structure. 5 micro-photographs are included which refer to the finishing treatments performed on a cast Fe and a bronze bearing shell. Data from tests on cylinders after 100 and 5000 km. service are reported. EF (12g)

The Change in Machining and Machine Tools with the New Extra Hard Carbides. (La Transformation de l'Usinage et Machines-Outils par les Nouveaux Carbures Extra Durs.) P. DEVAUX. *Revue Industrielle*, Vol. 62, Apr. 1932, pages 208-210; May 1932, pages 255-259. Description of factors upon which a good cutting operation depends. FR (12g)

"Shaving" Process Used to Cut Gear-Making Cost. ATHEL F. DENHAM. *Automotive Industries*, Vol. 67, Sept. 3, 1932, pages 304-305. Influence upon automotive design is seen as a result of a new machine tool which makes possible metal camshaft gear trains for automobiles. This machine tool is highly accurate and uniform gears at a low cost are possible by the "shaving" process. As an indication of the accuracy available the following tolerances for transmission gears are specified: Eccentricity, 0.001; Involute Form, 0.002; Helix Angle, 0.002/in.; Spacing, tooth-tooth, 0.002; Tooth Contact, 85% min. Carburized gears can also be finished with the machine. In such a case the roughing cut is taken, the gears are carburized, then finished by "shaving" process and finally hardened. DTR (12g)

Machinability and Tool Life. T. G. DIGGES. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 44-50. The author defines machinability as inversely proportional to tool life. The volume of data available on roughing cuts is discussed with some of its results. A test method for determining tool life on light cuts is described. The method involves the use of 2 tools set evenly in the same tool holder where the trailing tool indicates the wear of the cutting tool when it starts to cut. The use and limitations of drilling and milling cutter tests at present in vogue are discussed. WLC (12g)

Machinability Investigations as "Quick Methods" for Shop Tests. (Zerspanungsuntersuchungen als Kurzverfahren für den Betrieb.) W. LEYENSETTER. *Maschinenbau*, Vol. 11, June 2, 1932, pages 221-223. Since in turning as little loss as possible is desirable, the behavior of materials with light cuts is of increasing interest. The investigations made on deeper cuts do not reveal anything about the wear of the cutting edge with light cuts. The differences in this regard between the 2 cutting depths are pointed out. The "Pendulum Method" presents an appropriate means for determination of the wear of the cutting edge and is therefore used in determining the machinability of various materials at light cuts. 9 references. RFV (12g)

Modern Cylinder Reboring. (Moderne Zylinderinstandsetzung.) MEHNERT. *Deutsche Motorzeitschrift*, Vol. 9, Feb. 1932, pages 40-42. Reviews the trends in modern construction of boring machines for re-boring cylinders deformed in service, presents some data on their working speed, and shows a design of a machine brought on the market by the Hille Co., Dresden, which incorporates the latest advancements. EF (12g)

The Manufacture of Cutting Tools according to the Electric Butt Welding Method. (Die Herstellung von Schneidestählen nach dem elektrischen Stumpfschweissverfahren.) E. KOLLBRUNNER. *Schweizerische Technische Zeitschrift*, Vol. 29, Sept. 1, 1932, pages 525-535. The manufacture of cutting tools by butt welding high speed tool tips to tool shanks is discussed and illustrated by numerous examples. The welding method which is described in detail has been developed by the Brown Boveri Co. It is pointed out that this method will make possible the economic use of the expensive high speed steels. Endurance turning tests performed under comparable conditions show no differences of performance between tools made by this method and tools made of one piece. GN (12g)

Drawing & Stamping (12h)

Ears on Cupronickel Cups. W. H. Bassett & J. C. Bradley. *American Institute Mining & Metallurgical Engineers, Preprint*, Oct. 1932, 7 pages. The edges of cups drawn from cupronickel often have 4 ears. These ears are at positions of 45 or 90° (and 0°) to the direction of rolling, and their position and height depend on the previous mechanical and thermal treatment. The position of the ears could be varied at will (i.e. they could be made to form at 45 or 90° to the direction of rolling) by controlling the temperature of the penultimate and final anneal and the reduction between these 2 anneals. The height of the 90° ears increased with increased temperature of final anneal. The occurrence and position of ears observed in other alloys is discussed. JLG (12h)

Metallurgists join with Press Engineers and Die Designers in Improving Body Sheet Metal Production. Joseph Geschelin. *Automotive Industries*, Vol. 66, Mar. 1932, pages 496-497. Improvements in automobile body sheet metal production have come about as a result of (1) coöperative efforts of metallurgists in body plants and sheet mills in studying the behavior of sheet metal; (2) improved presses capable of higher pressures at much higher speeds; (3) significant advances in die design based on accumulated experience and constant research. DTR (12h)

Steels for Cold Pressing. G. R. Bolsover. *Proceedings Staffordshire Iron & Steel Institute*, Vol. 46, Session 1930-31, pages 17-40. Includes discussion. See *Metals & Alloys*, Vol. 2, June 1931, page 116. GTM (12h)

The Importance of the Blank-Holder in the Deep Drawing Operation. (Die Bedeutung des Faltenhalters beim Tiefziehen.) W. Linicus & W. Sachs. *Werkstattstechnik*, Vol. 26, June 15, 1932, pages 233-235. In order to decrease the power used in deep drawing, blank-holders were changed from those plain and parallel to the dies to those conically tapering off toward the inside. Experiments were made with ratios of tapers of 1:10, 1:20, 1:30, 1:50 and comparative tests to the ratio of 1:∞ of the plain holder. The tapering should conform to the thickness of the material in deep drawing. The Wazau testing machine was used for the measurements. The power necessary decreased essentially on account of the diminishing or almost lacking friction. No folding occurred even at a ratio of 1:10. The employed energy proved independent of the initially applied pressure of the blank-holder. In the first part, a general insight is given as to the conditions of the deep drawing process with various blank-holding pressures, etc. RFV (12h)

Stampings of Rustless Steel. Walter C. Schmidt. *American Machinist*, Vol. 76, June 23, 1932, pages 777-779. The punching, blanking and finishing of small parts of high-strength, heat treated rustless alloy steels is described. All production is automatic, the tolerances are ± 0.001″. Ha (12h)

Graphical Estimation of Drawing Pressures. *American Machinist*, Vol. 76, July 6, 1932, page 829. A chart is given to determine the pressure required to draw a shell and its practical application explained. Ha (12h)

Drawing with Compressed Air Drawing Apparatus. (Das Ziehen mit Druckluft-Ziehapparaten.) Max Thiele. *Zeitschrift für wirtschaftliche Fertigung*, Aug. 1932, pages 98-100. The paper first describes a new compressed air drawing apparatus built by L. Schuler, Göppingen, Germany. By using the apparatus the efficiency of drawing is increased due to an increase of drawing depth. On the basis of investigations by E. Ackermann (*Stahl und Eisen*, Vol. 51, May 14, 1931, page 619) and O. Kühner (*Zeitschrift für Metallkunde*, Vol. 22, June 1930, pages 190-193, see *Metals & Alloys*, Vol. 2, Jan. 1931, page 12) it is shown that the drawing depth can be increased essentially by the use of pneumatic crimping holders. By using a variable pressure for keeping down this apparatus its effect can be still further increased. GN (12h)

Experiments on Tube Drawing. (Versuche über Rohrziehen.) W. Jung-König, W. Linicus & G. Sachs. *Metallwirtschaft*, Vol. 11, July 15, 1932, pages 395-401. The tests were made with a 5000 kg. hydraulic tensile testing machine, rebuilt for the purpose, on tubes of annealed brass and annealed and half hard Lautal. The mandrels and plungers were made of hardened steel, ground and polished. Rapeseed oil was used as a lubricant. 4 conical dies with 4°, 8°, 16° and 25° angles and 2 curved dies were used. The force required to cold draw tubes of various outside and inside diameters was determined and the tabulated results include the % decrease in cross sectional area, tensile strength of tube after drawing and the residual strains in the tube. With any one die and drawing method the required force depended only on the reduction in area, regardless of whether it was due to reduction of outside diameter or of thickness. Consistent results were obtained only after the dies were carefully polished, especially the 4° conical die. The required force was greater for mandrel drawing than for plunger drawing. The difference was greater in the case of Lautal than brass, and was greatest with the 4° die. For hollow drawing of brass the force was about the same as for plunger drawing, of Lautal still less. With large reductions the force for all materials was higher the straighter the die was, on account of the increasing friction. For small reductions the opposite is the case. In mandrel drawing and hollow drawing the maximum reduction is reached when the drawing force equals the tensile strength of the tube. In plunger drawing it is possible to use drawing forces considerably above the tensile strength of the tube. The plunger method has the disadvantage that an additional operation is necessary to separate the plunger from the tube. The residual strains were measured by the method of sawing longitudinal and transverse slots in the tubes. The highest strains were found in the hollow drawn tubes, and in the plunger drawn tubes with the smallest reduction in wall thickness. The strains increased with increased die angle. These results were also confirmed by the mercury strain test. 13 references. CEM (12h)

Studies on Deep Drawing. (Untersuchungen über Tiefziehen.) W. Riem. *Zeitschrift für Metallkunde*, Vol. 24, July 1932, pages 157-161. The behavior of sheet metal is studied in a simple cup-drawing die with which may be measured the "hold-down" pressure, the plunger displacement, and the applied drawing force. Deep drawing curves (plunger displacement vs. applied force) are given for Al sheet (1.5 mm.) with different amounts of clearance between plunger and die (+36%, +10%, +3%, —11%, —24% of the sheet thickness). These curves rise to a max. force and then fall off. With amounts of clearance inferior to +36% a second maximum obtains owing to accumulation of material between plunger and die. Restricting the present study to *pure* deep drawing, the author uses amounts of clearance + 40% or greater. Deep-drawing curves with varying hold-down pressures are given for Al, showing that increasing hold-down pressures give increasing maximum drawing force. Large hold-down pressures result in tearing, while small result in wrinkling of the piece. The hold-down pressures just sufficient to prevent wrinkling were determined for discs of 100.5 mm. diam. (plunger diam. 50 mm.): Al, 7 kg./cm.^{2}; Cu, 13 kg./cm.^{2}; brass, 85% Cu, 17 kg./cm.^{2}; brass, 72% Cu, 20 kg./cm.^{2}; brass, 63% Cu, 17 kg./cm.^{2}; bronze, 6% Sn, 25 kg./cm.^{2}; Fe, 33 kg./cm.^{2}. The deep drawing capacity (drawability) is defined as the ratio of the maximum disc diam. drawn without fracture to the diam. of the cup drawn. With plunger 50 mm. diam., die ring 51.46 mm. for 0.5 mm. sheet and 54.12 mm. for 1.5 mm. sheet, radius of curvature of die edge 6 mm., the maximum diams. of blanks drawn without fracture and the drawing forces were found to be: Al—105 mm., 2100 kg.; Cu—107 mm., 5400 kg.; brass, 63% Cu—111 mm., 7900 kg.; brass, 85% Cu—109.5 mm., 7900 kg.; brass, 72% Cu—111 mm., 9400 kg.; bronze, 6% Sn—111 mm., 10,200 kg. The flow of metal during drawing is discussed, and theoretical deep-drawing curves are shown to be in good agreement with observed curves. (*Mitteilungen deutschen Materialprüfungsanstalten*, Sonderheft XVI, 1931). The deep-drawing capacities of the materials studied have an extreme difference of only 15%; factors such as homogeneity and surface are important. RFM (12h)

Pickling (12i)

Scale Removal by Acid Pickling. A. B. Winterbottom & J. P. Reed. *Iron & Steel Institute, Advance Copy* No. 14, Sept. 1932, 27 pages. Previous work had shown that scale consists of 3 layers: (1) an outer layer of Fe_2O_3 forming about 2% of the thickness, (2) an intermediate layer of Fe_3O_4 forming 18% of the thickness, and (3) a layer of FeO next to the metal amounting to 80% of the thickness. Microscopic examination and measurement of the reaction products from pickling proved that HCl or H_2SO_4 pickling solutions attack the FeO and not the other oxides. Scales formed at low temperatures are difficult to remove because they contain no FeO as they are formed at a temperature below which FeO is stable. The factors influencing the rate of pickling are discussed, and the effects of acid concentration, temperature, and Fe content of the pickling solution determined. Little difference was observed between the effects of 4 commercial inhibitors and glue size. All retarded the pickling rate. H_2SO_4 solutions must be operated at higher temperatures than HCl solutions for the same pickling times. H_2SO_4 solutions are the most economical if made from brown oil of vitriol. Working schedules for both H_2SO_4 and HCl pickling are given. Appendix I describes a method by which the free acid and Fe contents of pickling solutions may be determined from electric resistivity and density. Nomograms are shown for determining the Fe content when the density and acid content are known. Appendix II, by T. W. Lewis, describes a method for mounting sheet samples for microscopic examination in a bakelite molding compound. JLG (12i)

Cold Working (12j)

Methods of Bending Aluminum Tubing. F. V. Hartman. *American Machinist*, Vol. 76, July 6, 1932, pages 819-821. A number of bending methods especially for thin-walled Al tubes are described and illustrated. Ha (12j)

On the Internal Stress in Cold-Rolled Plates of Various Kinds of Metals. Kisuke Saito. *Kinzoku no Kenkyu*, Japan, Vol. 9, May 1932, pages 207-217. The magnitude of internal stress and its distribution in cold-rolled plates of various kinds of metals were measured by Heyn's method. Armco iron, 0.5% C steel, 70 : 30 brass, 60 : 40 brass, electrolytic Cu and bronze containing 6% Sn were investigated. In each case the degree of cold-rolling was kept constant so that the effect of the cold-working was the same. Plates of the metals were rolled from 2 mm. thick to 1 mm., cooling them frequently by cold water. In such a thin plate as 1 mm., the effect of thickness was negligible. The results were that: The compressive stress was maintained in both sides of the plate and its magnitude was greatest at the edge of the plate, and the middle part of it was subject to the tensile stress. The maximum magnitude of the internal stress in Fe and steel was 2 to 5 times greater than that in Cu and its alloys. KT (12j)

Discussion of the Article by W. Fahrenhorst and G. Sachs "Cracking of Cold Drawn Steel Bars." (Bemerkungen zu dem Aufsatz von W. Fahrenhorst und G. Sachs "Über das Aufreissen von kaltgezogenem Rundeisen.") Greulich. *Metallwirtschaft*, Vol. 10, Nov. 20, 1931, page 880. The cracking of cold rolled Thomas steel was attributed by Fahrenhorst and Sachs to tangential strains in the bars. (See *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 20). Greulich points out that Thomas steel of less than 30 mm. dia. has very little tendency to crack due to more evenly distributed stress during the greater % reduction than takes place in 40 mm. dia. bars. Open-hearth steel, even in large dia., seldom cracks. The photomicrographs of the Thomas steel indicate that nitrides have been precipitated. As a result of tests made on austenitic Cr Ni steel it is thought that the cracking of the Thomas steel is due to uneven strains produced by the irregular precipitation of nitrides. CEM (12j)

Reply to the Discussion of Dr. Greulich. (Erwiderung auf die Zuschrift von Herrn Dr. Greulich.) *Metallwirtschaft*, Vol. 10, Nov. 20, 1931, pages 880-881. The reasons for cracking given by Dr. Greulich are not agreed with. CEM (12j)

Results of Experimental Investigations on the Size of the Shank Diameter of a Bolt in the Cold Rolling of Screw Threads and the Shape and Manufacture of the Rolling Dies. (Ergebnisse experimenteller Untersuchungen über die Grösse des Bolzenschaftdurchmessers beim Kaltwalzen von Schraubengewinden und die Form und Herstellung der Walzbacken.) Walter Reichel. *Feinmechanik und Präzision*, Vol. 40, Aug. 1, 1932, pages 129-135. The process of forming threads by cold-rolling is discussed and the calculation of the required diameter of the shank of the bolt or screw before rolling and taking the tolerances into account by the form of the rolling die are explained. The calculation and manufacture of rolling dies is described. Ha (12j)

The Recovery from Cold-Working Judged by the Change of Hardness and Velocity of Dissolving. (Die Erholung von der Kaltbearbeitung, beurteilt nach der Aenderung der Härte und Auflösungsgeschwindigkeit.) G. Tammann & F. Neubert. *Zeitscrift für anorganische und allgemeine Chemie*, Vol. 207, July 1932, pages 87-92. Rolling or wire drawing at 20° C. increases the hardness and the velocity of dissolving of metals of higher melting points, heating decreases these 2 properties. The test data obtained for electrolytic Fe, Mn, Al, Ce, Zn are tabulated and should be referred to. 9 references. Ha (12j)

Manual Pipe Bending. (Einfaches Rohrbiegen von Hand.) E. Grasbon. *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, June 19, 1932, page 332. The described simple apparatus is equipped with a series of bending tools. The machine has an automatic feed. GN (12j)

Cold Working, Crystal Recovery and Recrystallization. (Kaltverformung, Kristallerholung und Rekristallisation.) H. Reischauer & F. Sauerwald. *Metallwirtschaft*, Vol. 11, Oct. 21, 1932, pages 579-582; Oct. 28, 1932, pages 591-593; Nov. 4, 1932, pages 604-607. A detailed review and discussion of cold working and recrystallization theory, including 161 references, covering simple deformation in single crystals, critical slip stress, change in orientation during plastic deformation, strengthening during deformation, and change in physical properties. These phases are discussed from the standpoint of the atomic lattice, kinetic and electron theories and atomic physics. The effect on strains, physical properties, crystal structure and X-ray structure are treated under crystal recovery and recrystallization. The conclusions are that both during cold working and recrystallization the various changes take place at different time intervals. CEM (12j)

Cleaning (12k)

Grease Removal with Alkalies. (Das Entfetten mit alkalischen Mitteln.) F. Wartenberg. *Metallwaren Industrie und Galvano Technik*, Vol. 30, Mar. 15, 1932, pages 129-130. Reviews the present state of alkaline cleaning means and gives grease removing lyes for various purposes. EF (12k)

P-3 Cleaning Installations in Electroplating. (P-3 Abkochanlagen in der Galvanotechnik.) F. Wartenweiler. *Metallwaren Industrie und Galvano Technik*, Vol. 30, Mar. 15, 1932, pages 130-133. Instructions are furnished for applying the emulsifying fat remover P-3. The various cleaning apparatuses are discussed and illustrated. EF (12k)

Modern Fat Removal. (Moderne Metallentfettung.) B. Wernik. *Metallwaren Industrie und Galvano-Technik*, Vol. 29, Aug. 15, 1931, pages 357-359. Principal remarks on fat removal and installations therefor. EF (12k)

Simplified Surface Improvement of Metal Parts Cast in Green Sand. (Vereinfachte Oberflächenveredlung von Nassguss- Metallwaren.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Oct. 19, 1932, page 567. Quality castings are cleaned in Fe barrels with sand, then pickled, treated in another barrel with steel balls, soapy water and polishing salts and are then ready for finish polishing. GN (12k)

DEFECTS (13)

Tentative Systematic Classification of Foundry Defects. (Tentative de Classification des defauts de Fonderie.) C. Gierdziejewski. *Bulletin de l'Association Technique de Fonderie*, Vol. 5, May 1932, pages 168-170. Abstract of the Polish exchange paper presented at the International Foundry Convention, Milan, Sept. 1931. See *Metals & Alloys*, Vol. 3, July 1932, page MA 221. FR (13)

A Contribution to the Question of the Formation of Flakes in Structural Steel. (Beitrag zur Frage der Flockenbildung in Baustählen.) W. Eilender & H. Kiessler. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, July 23, 1932, pages 729-735. The temporal and spatial distribution of the temperature in forgings was examined under different cooling conditions. The critical points were determined on 5 different Cr-Ni steels. The metallographic investigation did not reveal flakes due to slag inclusions, crystal segregation is the principal cause of flake formation. This can be reduced by annealing of longer duration at high temperatures. Practical experience corroborates this, and slow heating before rolling and forging is recommended. The formation of flakes can also be suppressed by slow cooling under ashes. No flakes are produced by air-cooling in the normalizing process and in quenching for refining. The general conditions and influence of interior stresses on flake formation are discussed. Ha (13)

An Inquiry into the Causes of the Breakage of Rolls. F. Bacon. *Proceedings Staffordshire Iron & Steel Institute*, Vol. 46, Session 1930-31, pages 115-143. Includes discussion and 15 references. The following topics are taken up: plane of rupture, fatigue failure, study of fracture, bending moment due to rolling load, effect of width of sheet, moment of neck pressure, calculation of specific rolling pressure, roll stresses corresponding to each pass, local concentration of stress and causes of crazing. There seems good reason to believe that careful preheating not only prevents sudden rupture of the roll due to unequal heating, but also tends to eliminate breakage by progressive cracking, because it hinders the formation of the surface heat cracks which act as starting points of deep running hair or fatigue cracks. See also "Fatigue Stresses with Special Reference to the Breakage of Rolls," *Metals & Alloys*, Vol. 2, Apr. 1931, page 80. GTM (13)

Explosions of Pressure Vessels. (Zerknalle an Druckgefässen.) *Zeitschrift des Bayerischen Revisionsvereins*, Vol. 36, Sept. 15, 1932, pages 191-195; Sept. 30, 1932, pages 207-211. The most interesting cases of explosions of pressure vessels which occurred in Bavaria in the past 15 years are described, the remedies are discussed to avoid or at least limit such failures. Part I deals with compressed air vessels, a rather large number of failures was due to inappropriate welding work. Part II deals with failures of pressure vessels heated by steam or hot water. GN (13)

Unusual Defects and Faults on Automobile Parts. (Bemerkenswerte Schäden und Mängel an Kraftfahrzeugteilen.) *Zeitschrift des Bayerischen Revisionsvereins*, Vol. 36, Oct. 15, 1932, pages 215-219. The paper describes and illustrates failures on clutches, tire rims with cracks in the spokes, axle-shanks, brakes and auxiliary equipment, etc. GN (13)

Causes of Fracture, Formation of Rust and Treatment of Stainless Table Ware. (Über Bruchursachen, Rostbildung und Behandlung von rostfreien Bestecken.) Kolberg. *Deutsche Goldschmiedezeitung*, Vol. 35, Sept. 24, 1932, pages 386-388. The paper discusses the failures of stainless table ware steels due to improper treatment by producer and consumer. Many practical hints are given for proper treatment of stainless knives on the part of the user. The question of rusting of stainless steels is discussed at length. Proper surface treatment is particularly emphasized. It is shown that fractures and formation of rust of stainless knives and other housekeeping equipment can be eliminated to a large extent by proper manufacturing and treatment. GN (13)

Bad Torsion in Wire for Pit Ropes. Richard Saxton. *Engineering*, Vol. 134, July 22, 1932, page 111. Author attributes bad torsion in high-strain wire to insufficient soaking during the patenting or annealing process. LFM (13)

Rail Fractures in the United States. (Schienenbrüche in den Vereinigten Staaten.) *Die Bautechnik*, Vol. 10, Sept. 30, 1932, page 582. After briefly describing the principle of the Sperry-Dudley method for detecting defects of rails in application, recent experiences with the methods in U. S. A. are enumerated. GN (13)

Note on a Failure of a High Strength Brass. J. E. Newson & A. Wragg. *Engineering*, Vol. 132, Oct. 16, 1931, pages 508-510. Condensed from paper read before the Institute of Metals, Zurich, Sept. 14, 1931. See *Metals & Alloys*, Vol. 3, Feb. 1932, page MA 45. LFM (13)

Surface Defects of Roller Bearings resulting from Non-Shockproof Spare Motors. (Ueber Laufflachenverletzungen an Rollenlagern von nicht Erschütternungsfrei eingebauten Ersatzmotoren.) H. J. Van Royen & H. Kornfeld. *Stahl und Eisen*, Vol. 52, Feb. 25, 1932, page 193. Paper of the Research Institute of the Vereinigte Stahlwerke A.-G. With a spare motor used to serve a sheet mill shears and arranged on the shears so that it was non-shockproof, it was noticed that almost all of the outer ring and inner ring of the roller bearing and the roll showed pressure wear marks or defects, apparently the result of unavoidable shocks from the non-stationary motor. Tests of the rings and rolls as to temper of material and other ordinary metallographic tests evidenced no causes for these defects. Accordingly a section of good original outer ring was tested with a Stanton endurance impact or hammering device, 12.5 cm.-kg. of hammering being done at the rate of 130 raps per minute. After the very small number of 50,000 raps a pressure point 0.8 mm. wide appeared on the revolving surface of the outer ring. The writers make it plain that the shocks from the motor caused these defects in the rings and rolls and that suitable means must be provided for the motors that they cease giving vibratory shocks, in order to guard against this type of defect. Illustration of apparatus for endurance rapping test is given. DTR (13)

Investigation on a Tube Failure of a High Pressure Boiler. (Untersuchung eines Rohrschadens an einem Hochdruckkessel.) G. Garre. *Die Wärme*, Vol. 55, Mar. 12, 1932, pages 173-175. An investigation was made into the causes responsible for the swelling up and cracking of a high pressure boiler tube. The result of the visual examination showed that the cracks pointed to the fire place and that a heavy formation of boiler scale took place (2-2.4 mm.) at this side while the thickness at the opposite side was only 1.3-1.5 mm. At the inside of the tube, a layer of Fe oxide was encountered around the regions which failed in service. A heavy scale was also found at the outside around the cracks. A metallographic investigation confirmed the visual examination that local over-heating occurred. The writer assumes that a temperature of 1000° C. was reached. EF (13)

Scabs. (Les dartres). Technical Committee of the Belgian Foundry Association. L. Delsaux. *La Fonderie Belge*, Jan. 1932, pages 8-9. In the French language there are 2 terms for designating the defect which is called "dartre volante" (flying scab) if sand is detached from the mold, causing a bump, and rises in the metal, causing an inclusion somewhere, and is called "dartre franche" (true or neat scab) if a slip of sand is only raised but not completely detached and the metal sinks behind. Causes of first kind of defect are: (1) sand insufficiently porous, (2) sand too tightly rammed, (3) irregular ramming, (4) ball of sand too hard or too wet, (5) neighborhood of an iron bar, (6) swelling of sand under heating, (7) insufficient strength of sand, (8) insufficient vent holes, (9) any reason of accumulation of gases in one point of the mold. Causes of second kind of defect: (1) Current of metal too strong or in wrong direction, (2) casting temperature too high, (3) fall of metal, (4) weakness of sand, (5) accident involving breakage of mold, (6) current of gas too strong through risers, (7) a low Si content of Fe would favor scab formation. FR (13)

CHEMICAL ANALYSIS (14)

Determination of Various Metals in the Chromium Plating Bath. Darwin Harris. *Chemist-Analyst*, Vol. 21, Sept. 1932, page 7. Cr is removed from the solution with $Pb(NO_3)_2$ and the filtrate is made alkaline with Na_2O_2. The precipitate is filtered off, reprecipitated and dissolved in HCl and H_2SO_4. Cu is separated as CuS and determined electrolytically, Fe is separated with NH_4OH and Ni precipitated with dimethyl glyoxime. Zn is determined in the combined filtrates from the Na_2O_2 treatment and Ni determination. CEM (14)

The Oxide Content of Aluminum and Methods for Its Determination. Remarks on the paper by H. Löwenstein. (Ueber den Oxydgehalt des Aluminiums und Methoden zu seiner Bestimmung. Bemerkungen zur gleichnamigen Arbeit von H. Löwenstein.) Friedrich L. Hahn. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 204, Jan. 1932, page 40. The author objects to a comparison of the results obtained by him on a 60% Al alloy with those obtained by Löwenstein on pure Al. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 361. Ha (14)

New Rapid Method for Determining Sulphur in Iron Ores and Rocks. C. C. Hawes. *Chemist-Analyst*, Vol. 21, Sept. 1932, pages 11-15. The method depends on the reduction of FeS_2 by powdered Fe to FeS and the evolution of S as H_2S. The sample is thoroughly mixed with 5 times its weight of Fe powder and heated in a covered Ni crucible to a bright red heat. After cooling the contents of the crucible are transferred to a flask and H_2S is evolved by treating with HCl in the usual manner and absorbed in KOH. The KOH solution is then acidified with HCl and the H_2S titrated with I solution. Good checks are reported between this and the fusion method. The time required is only 1½ hours. CEM (14)

Testing Precious Metals with the Touchstone. IV. C. M. Hoke. *Brass World*, Vol. 28, Sept. 1932, pages 185-186. This final installment deals with tests that require no acids, and points out the significance of the karat stamp. The tests discussed are flame, specific gravity, and karat. WHB (14)

Spectrograph Speeds Identification of Elements in Metals. Jos. Geschelin. *Automotive Industries*, Vol. 67, Sept. 17, 1932, pages 359, 377. The latest form of the spectrograph may be adapted to plant requirements where the average trained man may readily ascertain chemical substances in alloys, dispensing with the need for trained metallurgists. The following examples illustrate the wide range of industrial problems which come within the province of the spectrograph: (1) analysis of materials purchased on specifications limiting the amount of impurities; (2) guiding the development of alloys for die-castings, forgings, etc. by quantitative analysis for necessary constituents present in minute quantities; (3) rapid identification of unknown substances, mixed stocks, and the sorting of scrap; (4) checking of foundry mixtures to control special alloys. DTR (14)

Determination of Tellurium as Crystalline Tellurium and as Tellurium Dioxide. (Bestimmung des Tellurs als kristallinisches Tellur und als Tellur-dioxyd.) O. E. Clauder. *Zeitschrift für analytische Chemie*, Vol. 89, No. 7/8, 1932, pages 270-282. The processes to determine Te as well as Bi, Sb, Cu, Fe, Co and Ni are fully described. A few examples and 16 references are given. Ha (14)

Determination of Beryllium. (Zur Bestimmung des Berylliums.) L. Fresenius & M. Frommes. *Zeitschrift für analytische Chemie*, Vol. 89, No. 7/8, 1932, pages 273-285. The determination of Be in ores and minerals by the oxine method, alkalihydroxide method, acetate method, tannin method and ammonium sulphide method is described and the methods are compared as to their advantages in a certain case; volumetric and spectral-analytical methods can supplement each other very advantageously. 19 references. Ha (14)

5-7-Dibrom-o-Hydroxyquinoline, a New Specific Reagent for Copper, Iron and Titanium in Quantitative Analysis. (5.7-Dibrom-o(8)-Oxychinolin, ein neues spezifisches Reagens auf Kupfer, Eisen und Titan in der quantitativen Analyse.) R. Berg & H. Kuestenmacher. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 204, Feb. 9, 1932, pages 215-221. Detailed instructions are given to effect complete separation of Cu, Fe and Ti by addition of oxalic, malic and citric acid to bromo-oxychinoline. With certain modifications this method can also be applied in the presence of other metals. Ha (14)

The Potentiometric Volumetric Analysis in the Steel Mill Laboratory. (Die potentiomterische Massanalyse im Eisenhüttenlaboratorium.) P. Dickens & G. Thanheiser. *Die Naturwissenschaften*, Vol. 20, May 27, 1932, pages 407-408. See *Metals & Alloys*, Vol. 2, Dec. 1931, page 315. EF (14)

Determination of Hydrochloric Acid Soluble Aluminum in Aluminum Alloys. (Salzsäurelösliches Aluminium in Aluminiumlegierungen.) Bergmann. *Chemiker-Zeitung*, Vol. 56, Aug. 13, 1932, page 643. For the direct determination of Al a 5 to 10 g. sample is covered with H_2O and HCl is added slowly until the sample is decomposed. It is then boiled several minutes, filtered, and an aliquot part of the filtrate treated with H_2S in weakly acid solution. The precipitate is filtered off and H_2S boiled out of the solution. Al can then be determined either by precipitating with NH_4Cl and NH_4OH, or as phosphate, or by precipitating with oxyquinoline and weighing or titrating with Br. CEM (14)

The Separation of Nickel and Cobalt and their Quantitative Determination by the Filtration Method. (Ueber die Trennung von Nickel und Kobalt und ihre quantitative Bestimmung mittels der Filtrationsmethode.) H. T. Bucherer & F. W. Meier. *Zeitschrift für analytische Chemie*, Vol. 89, No. 5/6, 1932, pages 161-171. The determination of Ni and Co in mixtures of both metals by means of filtration is advantageously carried out by first precipitating them together by oxine and then precipitating them separately in 2% acetic acid with Na acetate. The method is applicable for small amounts of substance without impairing the accuracy. 19 references. Ha (14)

A Sensitive Test for Bismuth. Lewis Bernstein. *Chemist-Analyst*, Vol. 21, Sept. 1932, page 15. $PbNO_3$ is added to the HNO_3 solution to be tested and the 2 metals are precipitated with $(NH_4)_2CO_3$ and dissolved in acetic acid. To this solution 10-15 cc. 10% KI is added and the solution shaken. If Bi is present the PbI_2 which crystallizes has an orange to crimson color according to the amount present. CEM (14)

The Sampling of White Bearing Metals Containing Zinc. (Zur Bemusterung von zinkischen Weisslagermetallen.) Wolfgang Boehm & Wolfgang Jorre. *Metall und Erz*, Vol. 29, June 1932, pages 217-218. Bearing metal alloys of Sn, Cu, Pb and Zn segregate when they are cast, even if chill cast. Analysis of samples taken from several horizontal layers of a test block disclosed as much as 3% variation in Sn in a 40% Sn alloy. To obtain representative results it is necessary to saw the test block through vertically and use the sawings for analysis. If sawing is impossible, the test block should be drilled through vertically, the drillings melted and redrilled. CEM (14)

The Application of the Chlorine Residue Method for Pig Iron and Cast Iron. (Ueber die Anwendung des Chlorrückstandsverfahrens bei Roheisen und Gusseisen.) Eduard Maurer. *Archiv für das Eisenhüttenwesen*, Vol. 6, July 1932, pages 39-42. A summary of the literature on the application of the chlorine residue method. The relation between available O and oxidized Si was determined for the influence of MnO on ferro-silicon in a current of Cl, all data taken from Bardenheuer and Dickens' report, *Mitteilungen aus dem Kaiser Wilhelm Institut für Eisenforschung*, Vol. 9, 1927, pages 195-206. It may be shown that this relation is independent for the most part of the degree of dilution of O present and also SiO_2, and that the ratio of O present to Si present is final for any oxidation of Si likely to take place. When used in the determination of SiO_2 in cast iron and foundry pig iron, it is indicated that the amounts of SiO_2 obtained by the chlorine method may be considerably in error. The magnitude of the possible errors are given. In the literature not many investigations are to be found on chlorine residue tests for foundry pig and cast iron. DTR (14)

The Gravimetric Determination of Beryllium and its Separation from Fe^{III}, UO_2^{II}, Th^{IV}, Zr^{IV}, Tl^{I}, CrO_4'', MoO_4'', Cu^{II}, AsO_3''', SbO_3''', VO_4 and WO_4 by Guanidine Carbonate. (Ueber die gewichtsanalytische Bestimmung des Berylliums und seine Trennung von Fe^{III}, UO_2^{II}, Th^{IV}, Zr^{IV}, Tl^{I}, CrO_4'', MoO_4'', Cu^{II}, AsO_3''', SbO_3''', VO_4 und WO_4 durch Guanidincarbonat.) A. Jilek & Jan Kota. *Zeitschrift für analytische Chemie,* Vol. 89, No. 9/10, 1932, pages 345-354.
The method of separation of Be from Al by guanidine carbonate in a solution of ammonium tartrate and formaldehyde was extended to the above named materials with the same satisfactory results. Ha (14)

Spectralanalysis by Means of Sensitive Lines Lying in the Range of Optical Glasses. (Beiträge zur Spektralanalyse mit Hilfe in der Glassoptik zugänglichem Gebiet biegender empfindlicher Linien.) Wilhelm Kraemer. *Zeitschrift für Elektrochemie,* Vol. 37, Dec. 1931, pages 862-874. Describes a method which makes the use of quartz spectrographs for the determination of characteristic sensitive lines in the ultraviolet region unnecessary. A spectrograph of large aperture which is described is used and the method of evaluation of the spectrograms by means of the wave standards of Fe, Ni and H explained. The method was found suitable for the determination of Ca, Mn, Cu, Al, C, Si, Ti, Zr, Ni, Co, Cr, Mg, Mo, W, V, S, P and As in steels. Complete tables of the wave lengths determined are given. Ha (14)

Copper Foil as a Test for Antimony. B. Koone. *Chemist-Analyst,* Vol. 21, July 1932, page 7. Cu foil is recommended as a substitute for Pt in making the qualitative test for Sb in an acid solution of Sb_2S_3 and SnS. A clean piece of Zn in contact with the Cu produces a black spot if Sb is present, while if Sn is present a silvery spot is formed. As does not interfere. CEM (14)

A New Reagent for Magnesium. C. Franklin Miller. *Chemist-Analyst,* Vol. 21, Sept. 1932, pages 6-7. The reagent consists of an alkaline solution of tetraazo benzidine and resorcinol. 5 drops are added to the slightly acid solution to be tested and it is then made alkaline with NaOH. If Mg is present a dark blue lake forms and settles out. The test distinguishes Mg from Ca, Sr, Ba, Zn, Al and Bi, but Cu, Fe and Co, and excessive quantities of NH_4 salts interfere. Other diazo dyes besides benzidine can be used. CEM (14)

Potentiometric Determination of Platinum and Gold with Copper Chloride Solution. (Potentiometrische Bestimmung von Platin und Gold mit Kupferchlorurlösung.) Erich Müller & K. H. Taenzler. *Zeitschrift für analytische Chemie,* Vol. 89, No. 9/10, 1932, pages 339-344. The reduction of Pt solutions takes place in 2 stages: Pt (4)$\rightarrow$Pt (2) and Pt (2)$\rightarrow$Pt. The reduction of Au takes place in one stage: Au (3)$\rightarrow$Au. The method of the analysis and determination of amount of metal by e.m.f. against a neutral electrode is described. Ha (14)

The Application of X-Ray Spectroscopy for the Analysis of Ores and Metallurgical Products. (Die Anwendung der Röntgenspektroskopie zur Analyse von Erzen und Hüttenprodukten.) W. Noddack. *Metal und Erz,* Vol. 29, Feb. 1932, pages 67-71. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 331. CEM (14)

On the Spectroscopic Detection of a New Lead Isotope. (Über den spektroskopischen Nachweis einer neuen Blei-Isotope.) H. Schüler & E. G. Jones. *Die Naturwissenschaften,* Vol. 20, Mar. 4, 1932, page 171. The writers present evidence that they discovered the lead isotope Pb_{204} representing about 1% of the total intensity of all lead isotopes. EF (14)

Micro-electrolytic Determination of Silver, Mercury and Cadmium in ammoniacal Solution. (Mikroelektrolytische Silber-, Quecksilber- und Cadmium-Bestimmung in ammoniakalischer Lösung.) A. Okác. *Zeitschrift für analytische Chemie,* Vol. 89, No. 3/4, 1932, pages 106-112. The principles of a direct deposition of these metals as it has been done for Cu, Co and Ni are explained. Ag is deposited as finely-crystalline white and well adhering powder. Hg requires at first some treatment with CO_2, then it can be easily electrolyzed and is deposited on the cathode as a bright coating. Cd is deposited as a dense grayish film. The test results are reproduced in detail and some information is given on tests made to determine Cu, Ni and Co in the presence of organic radicals. Ha (14)

Experimental Notes on Quantitative Spectral Analysis. Notes on Quantitative Emission-spectral-analysis with particular Reference to the Quantitative Determination of Tin in Lead and of small Quantities of Titanium, Silicon and Iron in pure Aluminum. II. (Experimentelle Beiträge zur quantitativen Spektralanalyse. Beiträge zur quantitativen Emissions-Spektralanalyse unter besonderer Berücksichtigung der quantitativen Bestimmung von Zinn in Blei und der quantitativen Erfassung geringer Titan-, Silizium- und Eisengehalte in Rein-Aluminium.) A. Schleicher & J. Clermont. *Zeitschrift für analytische Chemie,* Vol. 86, No. 7/8, 1931, pages 271-288. The system Al-Si is investigated. Reference to the original paper must be made with respect to considerable analytical data which are tabulated. The use of homologous lines, as recommended by Gerlach and Schweitzer, is shown to be advantageous. For estimating the "last lines" a simple method of carrying out the experiments is described, by which Gerlach's views are confirmed. The use of the log sector photometer of Zeiss was found advantageous. Ha (14)

Rapid Method for the Determination of Copper in Cast Iron. (Schnellmethode zur Bestimmung von Kupfer in Flusseisen.) P. Schong. *Chemiker-Zeitung,* Vol. 56, July 2, 1932, page 524. A 5 g. sample is dissolved in HNO_3, an excess of NH_4OH added, and transferred to a 250 cc. volumetric flash. After shaking thoroughly and allowing the precipitate to settle, 100 cc. is filtered through a dry paper, acidified with HNO_3 and Cu determined by electrolysis. The method is rapid on account of short time required for dissolving sample in HNO_3. CEM (14)

Volumetric Determination of Large Percentages of Manganese. Frank W. Scott. *Chemist-Analyst,* Vol. 21, Nov. 1932, pages 6-7. A 500 mg. sample of ferro-manganese or spiegeleisen is dissolved in concentrated HNO_3 and the solution boiled down to 25 cc. The Mn is oxidized with $KClO_3$ and after cooling an excess of a standard H_2SO_4, H_2O_2 solution is added. After stirring to dissolve the precipitated $MnO(OH)_2$, the excess H_2O_2 is titrated with $KMnO_4$ solution. In the case of basic open hearth slag the sample is first dissolved in concentrated HCl, evaporated to dryness and SiO_2 filtered off. After evaporating the filtrate almost to dryness HNO_3 is added and the determination continued as for ferro-manganese. The method is quick and accurate and checks well with gravimetric determinations. CEM (14)

The Determination of Sodium in Aluminum. (Beitrag zur Bestimmung von Natrium im Aluminium.) K. Steinhaeuser & J. Stadler. *Zeitschrift für analytische Chemie,* Vol. 89, No. 7/8, 1932, pages 268-270. The exact procedure is described by which Fe, Al, Mn, Cr, Ti and Mg are removed from the 100 g. sample and finally Na is determined as Na_2SO_4. Ha (14)

The Determination of Caesium in Presence of Rubidium and other Alkali Metals. (Die Bestimmung des Caesiums in Gegenwart von Rubidium und anderen Alkalimetallen.) N. A. Tananaeff & E. P. Harmasch. *Zeitschrift für analytische Chemie,* Vol. 89, No. 7/8, 1932, pages 256-262. Describes a method using the property of Cs to form with Bi and halogens complex compounds $CsBiI_4$, $CsBiI_5$ and $Cs_3Bi_2I_9$. The procedure for the determination of Cs is illustrated by an example. Ha (14)

Chemical Analysis of Modern Alloy Steels. W. W. Stevenson. *Industrial Chemist,* Vol. 8, June 1932, pages 213-216; July 1932, pages 256-259; Aug. 1932, pages 291-294; Sept. 1932, pages 320-323. The author claims to have had wide experience in the analysis of modern alloy steels. He attempts to summarize the most important methods, with the modifications necessary in the presence of interfering elements. The following elements are included in his discussion: C, Si, S, P, Mn, Ni, Cr, Cu, Al, W, Mo, Co, V, Ti and Zr. The author does not deal at length with the theoretical side of the methods given and states that these methods are capable of operation by the careful and intelligent works' chemist. In his conclusion the author gives a series of preliminary tests designed to give qualitative information as to the type of steel being analyzed such information being useful to the subsequent quantitative determination. RAW (14)

Rapid Method for the Determination of Arsenic in White Metals. (Schnellmethode zur Bestimmung von Arsen in Weissmetallen.) K. L. Ackermann. *Chemiker-Zeitung,* Vol. 55, Sept. 12, 1931, page 702. The sample is dissolved in HNO_3, boiled dry and taken up in HCl. After transferring to a distillation flask 2 g. $CuCl_2$ is added to reduce to $AsCl_3$, the solution saturated with HCl and 1/3 of the volume is distilled in a stream of HCl. If too much of the solution is distilled some Sb will come over too. The distilled portion is neutralized with NaOH and finally with $NaHCO_3$ and As titrated with I. The neutralization must be carried out in ice water to prevent excessive heating up. The method requires 2 hours and is accurate within .0002 g. CEM (14)

Determination of Titanium in Alloyed Steels. (Bestimmung des Titans in legierten Stählen.) J. Arend. *Zeitschrift für analytische Chemie,* Vol. 89, No. 3/4, 1932, pages 96-100. A method of volumetric determination and separation of Ti from Fe, Cr, Mn, Co and Ni is described in detail. Ti in purest form is determined as Ti dioxide and the isolated metallic Ti by colorimetric determination according to Weller. Ha (14)

Dimethylglyoxime as a Test Reagent for Metals. Irwin Stone. *Chemist-Analyst,* Vol. 21, Nov. 1932, page 8. When dimethylglyoxime is added to a solution containing ferrous iron, tartaric acid and an excess of NH_4OH it turns deep red due to the presence of Fe, the red gradually fading as the Fe is oxidized. To test for Bi, dimethylglyoxime is added to the acid solution and it is then made strongly alkaline with NH_4OH. Bi forms a yellow precipitate. The reaction cannot be used for quantitative analysis. To test for Cu the solution is neutralized, .2 to .3 cc. of .1% dimethylglyoxime solution is added and 1 cc. of saturated KIO_3 solution. If Cu is present a violet red coloration develops slowly. The test is sensitive to .001 mg. of Cu and can be used in water analysis. Dimethylglyoxime forms yellow precipitates with Pt, Pd and Au, soluble in NH_4OH or KCN. Pt reacts only in boiling solution. If the precipitates are reduced with sodium formate and dissolved in NaOH, Pd remains in solution, but Pt is precipitated as an unstable purple compound by excess NaOH. Co forms a brown solution or precipitate with dimethylglyoxime, not affected by the addition of mineral acids. CEM (14)

Analyses of Inclusions in High-carbon Tool Steels. Haakon Styri. *American Institute Mining & Metallurgical Engineers, Preprint,* Oct. 1932, 8 pages. The method recently developed by Fitterer was applied to C and Cr tool steels. Residue analyses of 5 high-C steels, some containing as much as 1% Cr, are given in detail. Carbides were found in the residues of unhardened steels, but they could be kept out by quenching the samples prior to analysis. All of the S remained in the residues. The Si recovered in the residues did not vary from test to test on same steel. Various electrolytes and diaphragms were studied. JLG (14)

Rotating Mercury Electrode and its Application in Electroanalysis. (Rotierende Quecksilberelektrode und ihre Anwendung in der Elektrolyse.) Panta S. Tutuntzick. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 202, Dec. 24, 1931, pages 297-304. A rotating electrode is constructed which permits rapid, accurate determination with but little Hg. With this electrode Hg and Cu determinations are performed with great accuracy. Zn can also be determined in acid $ZnSO_4$ solutions; however, results are somewhat high. 11 references. Ha (14)

Critical Investigations on the Applicability of the Hot Extraction Method for the Determination of Oxygen in Iron and Steel. (Kritische Untersuchungen über die Anwendbarkeit des Heissextraktionsverfahrens zur Bestimmung von Sauerstoff in Eisen und Stahl.) H. Wentrup. *Stahl und Eisen,* Vol. 52, June 9, 1932, pages 565-566. Summary and discussion of determination of O by Hessenbruch's original hot extraction method, as modified by Ericson and Benedicks and published in *Jernkontorets Annaler,* Vol. 150, 1931, pages 549-588. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 308. DTR (14)

Spectroscopic Estimation of Nickel, Manganese and Chromium in Steels. F. Twyman & A. Harvey. *Iron & Steel Institute, Advance Copy* No. 11, Sept. 1932, 11 pages; *Engineering,* Vol. 134, Oct. 21, 1932, pages 487-488. Arc spectra of a number of steels containing various amounts of Ni, Mn and Cr were obtained. A logarithmic sector was used and the height of certain Ni, Mn and Cr lines compared with Fe lines. A straight-line relationship was found between the logarithm of the % of the constituent and the logarithm of the intensity of the line. Actually, the difference in height of the standard Fe line and the height of the line of the constituent being determined was plotted. An accuracy of the order of 10% of the content of the substance being determined was obtained. The maximum quantities present in the samples were: 5.09% Ni, 0.89% Mn, and 1.49% Cr. As the Cr content exceeded 1% the log of the intensity failed to increase linearly with the log of the %. The line pairs used were: Ni-3347.93 Fe and 3371.99 Ni; Mn-4859.75 Fe and 4823.52 Mn; Cr-5192.36 Fe and unresolved Cr doublet 5204-54 and 5206.04. 5 references. LFM + JLG (14)

Separation of Titanium from Aluminum according to the Oxyquinoline-acetate Method. (Trennung des Titans von Aluminium nach der Oxychinolinacetat-Methode.) Herman Wabnitz. *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Aug. 11, 1932, page 594. Method described. Advantages as compared with other methods are discussed. GN (14)

Bronze Analysis. P. W. Uhl. *Chemist-Analyst,* Vol. 21, July 1932, pages 4-5. The sample of phosphor bronze is dissolved in 1:1 HNO_3 and boiled to a small volume. After dilution with H_2O the sample is filtered and the residue ignited at 1400° F. The residue of $SnO_2 + P_2O_5$ is weighed and treated with 25 cc. H_2O and 25 cc. 1:1 HCl, boiled and filtered. The residue is ignited and weighed as SnO_2. P is taken by difference from these 2 weights. Pb is determined as $PbSO_4$, Cu is electrolyzed, Fe and Al precipitated with NH_4OH and separated with NaOH. Ni is precipitated with dimethyl glyoxime and Zn determined as $Zn_2P_2O_7$. CEM (14)

Wet Oxidation Method for the Determination of Total Sulphur in Slags, Ores, Cinders, etc. W. R. West. *Chemist-Analyst,* Vol. 21, July 1932, pages 11-14. Ores are oxidized with Br and glacial acetic acid in HNO_3 solution, evaporated to dryness repeatedly with HCl and S is precipitated with $BaCl_2$ in a solution containing 11 cc. HCl and 1 g. Al in 1600 cc. Slags are oxidized with $KClO_3$ and HNO_3, evaporated to dryness and the HCl solution treated with NH_4OH and $(NH_4)_2CO_3$. The filtrate is acidified with 10 cc. excess HCl and S precipitated with $BaCl_2$. CEM (14)

Determination of Cyanogen in Pickling Baths. (Zur Bestimmung des Cyankalis in Dekapierbädern.) A. Wogrinz. *Metallwaren Industrie und Galvano-Technik,* Vol. 30, Apr. 1, 1932, page 154. NaCN can be titrated with $AgNO_3$ even if $Na_4Fe(CN)_6$ is present. EF (14)

Investigations on electrolytic Zinc Preparations and Baths. (Zur Untersuchungen von galvanotechnischen Zinkpräparaten und Bädern.) A. Wogrinz. *Metallwaren Industrie und Galvano-Technik,* Vol. 30, Apr. 1, 1932, pages 154-155. ZnS is precipitated by solid Na_2S and determined iodometrically. EF (14)

Analytical Control of Chromium Plating Baths. (Die Betriebskontrolle der Chrombäder.) A. Wogrinz. *Chemiker-Zeitung,* Vol. 56, July 20, 1932, page 571. In the sulphate determination reduction of the Cr with alcohol gives low SO_4 results. It is better to dilute a 25 to 100 cc. sample to 750 cc., add 25 cc. HCl, heat, and precipitate with $BaCl_2$. The ignited $BaSO_4$ is then fused with Na_2CO_3, the melt dissolved in H_2O + HCl + CH_3OH, heated, $BaSO_4$ reprecipitated, fused again and reprecipitated and weighed. For the CrO_3 and Cr_2O_3 determinations a 1 cc. sample is diluted to 200 cc., treated with 5 drops HNO_3 and a saturated solution of $HgNO_3$, heated and stirred, filtered and the precipitate ignited. It is fused with Na_2O_2, the melt dissolved in H_2O and an aliquot part is acidified with an excess of H_2SO_4. The solution is boiled 5 minutes, KI is added, and the liberated I titrated with $Na_2S_2O_3$. Another 5 cc. sample is treated with NaOH, boiled and filtered. The precipitate is fused with Na_2O_2, the melt dissolved in H_2O and filtered. The residue is fused with Na_2O_2 again, dissolved, and the combined solutions are titrated as before. Fe can be determined in insoluble residue. CrO_3 and Cr_2O_3 are calculated from 2 titrations. CEM (14)

ECONOMIC (16)

Sound Cost Methods Reduce Waste. A. E. Grover. *American Machinist*, Vol. 76, June 16, 1932, pages 749-753. A simple, complete and accurate method for ascertaining production cost is explained by forms of cost sheets and classification of operating cost. Ha (16)

The Economic Significance of Specifications for Materials from the Standpoint of a User of Steel. P. Parke. *Journal Western Society of Engineers*, Vol. 36, Oct. 1931, pages 282--284. See *Metals & Alloys*, Vol. 3, Feb. 1932, page MA 47. GTM (16)

The Problem of Self-costs in Foundry Operation. (Das Selbstkosten-problem in Giesereibetrieben.) W. Hartung. *Die Giesserei*, Vol. 19, Sept. 2, 1932, pages 354-359. The distribution of total cost of production to costs pertaining to actual production and to overhead, especially how to determine the latter, is discussed. Examples illustrate how cost of metal, cost of mold included labor, and general overhead are related and how they should be determined in quantity production. Ha (16)

Metal Mining in California, 1932—Advance Summary. V. C. Heikes. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 157, Jan. 10, 1933, 2 pages. The total value of Au, Ag, Cu and Pb produced in Calif. in 1932 was $11,918,750, a decrease of $469,000 compared with 1931. Au increased 8% to $11,648,580 ($10,814,162 in 1931), 98% of the total value; Calif. was the most important Au producing state. Output of all other metals decreased, Ag and Pb about 40% and Cu 90% as compared with 1931. Ag output was about 500,000 oz., Cu about 1,105,000 lbs., and Pb about 2,206,000 lbs. AHE (16)

Gold, Silver, Copper and Lead in Texas in 1930. Chas. W. Henderson. *United States Bureau of Mines, Mineral Resources of the United States*, 1930, part 1, Sept. 9, 1932, pages 813-815. The value of Au, Ag, Cu and Pb production in Texas in 1930 was $191,949, as compared with $683,920 in 1929. Au declined from $26,439 to $3,648; Ag from 1,020,516 oz. to 389,239 and Ag values from $543,935 to $149,857; Cu from 341,000 lbs. worth $60,016 to 143,100 lbs. worth $18,603; and Pb from 849,683 lbs. to 396,820 lbs., valued, respectively at $53,530 and $19,841. AHE (16)

Metal Mining in Nevada, 1932—Advance Summary. V. C. Heikes. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 158, Jan. 10, 1933, 2 pages. The value of mine production of Au, Ag, Cu, Pb and Zn in Nev. in 1932 decreased from $11,673,787 in 1931 to $5,146,390 in 1932. Each metal decreased as compared with 1931, Au from $2,941,473 to $2,728,680, Ag from 2,562,071 oz. to about 1,553,000 oz., Cu from 72,634,497 lbs. to 31,333,000 lbs., Pb from 15,860,634 lbs. to about 1,260,000 lbs., and Zn from 20,861,348 lbs. to 1,070,000 lbs. AHE (16)

Gold, Silver, and Lead in South Dakota in 1930. Charles W. Henderson. *United States Bureau of Mines, Mineral Resources of the United States*, 1930, part 1, June 18, 1932, pages 679-686. In 1930 S. Dakota produced Au worth $8,418,008, as compared with $6,549,599 in 1929. Ag output of 105,236 oz. was an increase of 20,104 oz. over 1929 but a decline of almost $5,000 in value to $40,516. AHE (16)

Gold, Silver, Copper, Lead and Zinc in New Mexico in 1930. Chas. W. Henderson. *United States Bureau of Mines, Mineral Resources of the United States*, 1930, part 1, Sept. 9, 1932, pages 793-811. The value of recoverable Au, Ag, Cu, Pb and Zn from mines in New Mexico in 1930 was $13,748,217, 43.82% less than in 1929. The value of Au output declined from $727,162 to $669,156. Ag production was 1,107,335 oz. worth $426,324 (1,121,546 oz., $597,784 in 1929). Cu output was 65,150,000 lbs. valued at $8,469,500 (97,717,262 lbs., $17,198,238 in 1929). Pb output declined from 22,260,811 to 20,756,900 lbs. worth $1,402,431 in 1929 and $1,037,845 in 1930. Zn production was 65,529,000 lbs. worth $3,145,392 (68,910,000 lbs., $4,548,060 in 1929). AHE (16)

Gold, Silver and Copper in Wyoming in 1930. Chas. W. Henderson. *United States Bureau of Mines, Mineral Resources of the United States*, 1930, part 1, June 18, 1932, pages 687-690. In 1930 Wyoming mines produced Au, Ag and Cu valued at $10,713, as compared with $1,766 in 1929. Au increased from $995 to $9,158; Ag from 26 to 122 oz. and $14 to $47; Cu from 4,301 to 11,600 lbs. and Cu value from $757 to $1,508. AHE (16)

Metal Mining in Colorado, 1932—Advance Summary. Chas. W. Henderson. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 161, Jan. 11, 1933, 6 pages. From statistics for 11½ months and estimates for ½ month, the output of various metals in Colo. in 1932 was Au 322,239 oz., Ag 1,759,047 oz., Pb 4,115,000 lbs., Cu 7,231,000 lbs., and Zn 251,000 lbs., compared with Au 233,300 oz., Ag 2,195,914 oz., Pb 13,768,000 lbs., Cu 8,165,000 lbs., and Zn 32,373,000 lbs. in 1931, an increase for Au and a decrease for all others. The gross value is $7,721,415 as compared with $7,942,154 in 1931. Figures by counties are given. AHE (16)

Metal Mining in Wyoming, 1932—Advance Summary. Chas. W. Henderson. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 168, Jan. 16, 1933, 1 page. The estimated output of metal mines in Wyo. in 1932 was only 207 oz. of Au and 190 oz. of Ag. AHE (16)

Metal Mining in New Mexico, 1932—Advance Summary. Chas. W. Henderson. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 164, Jan. 13, 1933, 2 pages. Output of certain metals in N. Mex. in 1932 was Au 25,047 oz., Ag 1,202,854 oz., Pb 21,550,000 lbs., Cu 30,704,000 lbs., and Zn 50,958,000 lbs. compared with 1931 figures of Au 31,161 oz., Ag 1,041,859 oz., Pb 22,537,000 lbs., Cu 61,503,100 lbs., and Zn 55,732,000 lbs. The total value was $4,913,014, a decrease of 48% from 1931. AHE (16)

Computing Annealing Costs of a Cold Rolling Mill. (Berechnung der Glüherekosten einers Kaltwalzwerkes.) Karl Veit. *Stahl und Eisen*, Vol. 52, July 7, 1932, page 667. An equation is derived for calculating costs of dark or bright finish pot annealing in a cold mill. DTR (16)

Canada and the Base Metals. *Mining Journal*, London, Vol. 178, Sept. 3, 1932, page 588. Canadian production of Cu, Ni, Pb, Zn, Al, Ra, Co and the rare metals is reviewed briefly. AHE (16)

Development of Russian Chemico-Metallurgical Industry. *Mining Journal*, London, Vol. 178, Aug. 6, 1932, page 533. Russia has begun the operation of the largest European H_2SO_4 plant. Of the 7 furnaces at Cheliabinsk, 4 make ferro-chrome and 3 ferro-silicon, the former direct from the ore. Sulphate deposits will be used in the manufacture of caustic soda, S and H_2SO_4. AHE (16)

The Present Position of the Iron and Steel Industry. *Engineer*, Vol. 153, Feb. 5, 1932, pages 155-156. Extracts from a report of a Committee of Iron and Steel Manufacturers presented to the President of the Board of Trade on Jan. 12, 1932. The report reviews the present depressed condition of the industry, discusses the causes of the decline and the means of building up the industry. LFM (16)

Production of Magnesium. (La fabrication du magnesium.) *Journal du Four Electrique*, Vol. 41, May 1932, pages 165-166. Abstract of paper by F. Ravier published in *Chimie et Industrie*. See "The Magnesium Industry in France," *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 309. JDG (16)

Russian Cast Iron. *Engineer*, Vol. 153, May 27, 1932, page 595. Brief summary of Memorandum No. 5, the Birmingham Bureau of Research on Russian Economic Conditions (University of Birmingham) which discusses the progress of the Five Year Plan. LFM (16)

Iron and Steel in India. *Engineer*, Vol. 153, Feb. 12, 1932, page 193. From a D. O. T. Report on the Conditions and Prospects of United Kingdom Trade in India, 1930-31 by Thomas M. Ainscough. LFM (16)

Metal Mining in Idaho, 1932—Advance Summary. C. N. Gerry & Paul Luff. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 162, Jan. 12, 1933, 3 pages. The value of Au, Ag, Cu, Pb and Zn produced from mines in Idaho in 1932 was $7,443,270, the smallest since 1894, and a decrease from $11,418,013 in 1931. Au output, $878,553, more than doubled that in 1931 ($379,563) and was the largest since 1916. Pb output (142,000,000 lbs. worth $3,976,000) was less than any year since 1902. The output of Ag, Cu and Zn was far below the average for the last decade. Ag output in 1931, 7,220,923 oz. worth $2,094,068, declined to 6,700,000 oz. worth $1,889,400; the state was the second largest Ag producer. Cu production declined from 1,144,915 in 1931 to 1,097,000 lbs. in 1932, worth $104,186 and $66,917, respectively. Zn recovery decreased from 39,137,212 to about 20,400,000 lbs. and from $1,487,214 to $632,400. AHE (16)

Foundry Cost (Le prix de revient en fonderie). G. Foblets. *La Fonderie Belge*, Vol. 2, Jan. 1932, pages 11-13. Distribution of charges. This distribution is preferably made according to salaries rather than according to weight of castings. FR (16)

Metal Mining in Arizona, 1932—Advance Summary. C. N. Gerry & T. H. Miller. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 160, Jan. 11, 1933, 2 pages. The value of Au, Ag, Cu and Pb produced from Ariz. mines in 1932 was $13,172,871, a marked decrease from $40,144,694 in 1931 largely due to decline in Cu output from 401,344,909 lbs. in 1931 to 183,887,000 lbs. in 1932, less than any year since 1903. Au production decreased from $2,608,495 to $1,319,690, and Ag from 3,245,311 oz. to about 2,057,000 oz. Pb output increased slightly from 1,964,112 lbs. to about 2,000,000 lbs. in 1932. AHE (16)

Metal Mining in Utah, 1932—Advance Summary. C. N. Gerry & T. H. Miller. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 166, Jan. 16, 1933, 3 pages. Utah mines in 1932 produced Au, Ag, Cu, Pb, and Zn worth $14,167,603, 49% of the value in 1931, and a lower value than any year since 1899. Utah remained first in Ag production, third in Cu (after Ariz. and Mont.), and third in Pb (after Mo. and Id.). Output of all metals declined, Au from $4,108,328 to $2,946,832, Ag from 8,290,966 oz. to 6,979,500 oz., Cu from 151,236,505 lbs. to about 65,906,000 lbs., Pb from 158,423,453 lbs. to 122,487,000 lbs., and Zn from 74,581,072 lbs. to about 58,150,000 lbs. AHE (16)

World Steel Trade: Position and Prospects. E. T. Good. *Engineer*, Vol. 153, May 20, 1932, page 565. Gives export and import figures for Britain as well as production figures of Britain, U. S., Germany, France, and Belgium. There is brief discussion of conditions in America and in Russia. LFM (16)

Metal Mining in Washington, 1932—Advance Summary. C. N. Gerry. United *States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 167, Jan. 16, 1933, 2 pages. The value of Au, Ag, Cu, Pb, and Zn produced from mines in Washington in 1932 was $297,543, $565,498 in 1931. Au output increased nearly 62% to $60,035; all others decreased—Ag from 22,410 oz. to 17,500 oz., Cu from 202,503 lbs. to about 5,000 lbs., Pb from 2,771,116 lbs. to 1,879,000 lbs. and Zn from 9,947,495 lbs. to 4,588,000 lbs. AHE (16)

Production of Gold, Silver, Copper, Lead, and Zinc in Utah in 1931, by Counties. C. N. Gerry. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 148, Sept. 8, 1932, 1 page. Metal output in Utah in 1931 (and in 1930) was: Au 198,740.12 oz. (208,455.03 oz.), Ag 8,290,966 oz. (13,129,421 oz.), Cu 151,236,505 lbs. (180,526,423 lbs.), Pb 158,423,453 lbs. (230,989,780 lbs.), Zn 74,581,072 lbs. (88,990,938 lbs.) and total value $28,970,974 ($48,653,464). AHE (16)

Metal Mining in Montana, 1932—Advance Summary. C. N. Gerry & Paul Luff. *United States Bureau of Mines, Mineral Market Reports*, No. M.M.S. 163, Jan. 12, 1933, 2 pages. The value of Au, Ag, Cu, Pb and Zn produced from mines in Mont. in 1932 was $6,667,957, less than ½ the value in 1921 and about $13,000,000 less than 1931; the decrease was due to curtailed production and declining prices. Cu decreased from 184,555,735 to 84,717,000 lbs., Pb from 8,860,186 to 2,375,000 lbs., Zn from 13,494,986 to 4,475,000 lbs., Ag from 3,829,837 to 1,671,000 oz. and Au from 40,112.16 to about 39,850 oz. Cu value was the lowest since production figures were first recorded in 1903; nevertheless the state held second position in Cu output. Details of various operations are given. AHE (16)

Gold and Silver in 1930. J. P. Dunlop. *Mineral Resources of the United States, 1930*, Part 1, Oct. 6, 1932, pages 817-857. Domestic production of Au increased $1,596,200 over 1929, due to an output of 2,285,603 oz. worth $47,247,600, and Ag production declined 10,579,741 oz. and $13,149,725 to an output of 50,748,127 oz. worth $19,538,029. Estimated world production of Au was $416,751,500 an increase of $13,647,600 over 1929. The 2 most important gains were South Africa with $6,284,800 and Canada with $3,695,400. U. S., Mexico, Australasia, the Philippine Ids., Chosen, Yugoslavia and the Belgian Congo also increased output; Brazil, Peru and British India decreased production. Ag output was 248,139,100 oz., a decrease of 12,830,900 oz. The largest decreases were in the U. S., Mexico and Peru; the largest increases were Canada (3,292,600 oz.), Chile, Poland, Bolivia (2,274,900 oz.) and Central America. The U. S. and Canada produce 31% of the total; Mexico, Central America and South America 54%; and the rest, mainly Australia, Burma, Japan and Spain 16%. More than ½ of world output is produced or refined in U. S. Details are given. AHE (16)

Steel and Empire Trade. E. T. Good. *Engineer*, Vol. 154, July 15, 1932, pages 56-57. Points out opportunities for developing inter-Imperial business in Fe ore, Fe and steel, and steel products on mutual benefit lines. Discusses conditions in Canada and India. LFM (16)

Gold, Silver, Copper, Lead and Zinc in the Eastern States in 1931. J. P. Dunlop. *Mineral Resources of the United States, 1931*, Part 1, Sept. 12, 1932, pages 1-7. The mines of the Eastern States yielded metals in 1931 valued at $18,179,046, a decrease of $6,808,915 from 1930. Au output was $23,827 ($46,637 in 1930). Ag production was 63,949 oz. worth $18,545 (123,590 oz. worth $47,582 in 1930). Cu production declined 14,886,031 lbs. to 23,346,000 lbs. valued at $2,124,486, less than ½ the value in 1930. Pb output declined little in amt., from 16,734,000 to 15,948,000 lbs. worth $590,076 $836,700 in 1930). Zn production of 313,394,000 lbs. worth $15,422,112 compared favorably with 336,488,000 lbs. worth $19,086,878 in 1930. AHE (16)

Economics of Tungsten. Paul M. Tyler. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 80-83. The author recounts briefly the applications of W. The occurrence and sources of tungsten ores are discussed and figures given for production from 1905 to 1929. Use of Mo as a substitute for W in high speed steel is briefly touched upon. Fluctuation of market is discussed with the effects of stocks of metal and use of high speed steel scrap for steel melting. WLC (16)

Summarized Data of Tin Production. John B. Umhau, et al. *United States Bureau of Mines, Economic Paper* 13, 1932, 34 pages. World Sn production for 1801-1930 was 6,600,000 long tons. Annual production figures for each country are given tabularly and discussed. Production for the last 25 yrs. is nearly equal to that of the preceding 105 yrs. Asia has contributed 67.7% of the output since 1800, S. America 11.9%, Europe 11.6%, Australia 6.1% and Africa 2.6%. AHE (16)

Trade with Russia from the Point of View of Foundry Technique. (Das Russlandgeschäft von der giessereitechnischen Zeite.) A. Windhausen & Wolff. *Die Giesserei*, Vol. 18, Nov. 27, 1931, pages 905-906. The very severe conditions prescribed by Russian regulations for cast Fe with regard to uniformity of hardness are compared with the experiences made to satisfy them. Rejected parts cannot be considered as actually bad cast Fe. Ha (16)

PLANTS & LABORATORIES (17)

Modern Works Plant and Equipment for the Hot-working of Nickel and Nickel Alloys. W. R. Barclay, G. A. V. Russell & H. Williamson. *Institute of Metals, Advance Copy* No. 607, Sept. 1932, 19 pages. Describes recently constructed plant of Mond Nickel Co., which is to produce Ni strip and sheet as well as materials such as Ni-silver and Ni-Cr heat-resistant alloys. The American practice of casting square ingots and slabbing is to be used rather than the European practice of casting slabs. The ingots are machined. They are usually cogged in a forging press prior to rolling, but this operation may be omitted for some products. 2 rolling mills driven by the same motor were installed. One, a 3-high universal mill takes up to 9″ x 9″ ingots. The horizontal rolls have a diameter of 18″ and a length of 21″. The vertical rolls have a diameter of 14″. The other rolling unit is a 3-high Lauth sheet mill. The rolls are 52″ long. The top and bottom rolls have a diameter of 26″ and the middle roll 16″. An electric furnace is used for heating the sheet bar. In some general remarks on rolling the high temperature necessary for rolling Ni and its alloys and the deleterious effect of S are stressed. JLG (17)

Acme Steel Company's High Speed Strip Mill. Wm. M. Ballenger. *Blast Furnace & Steel Plant,* Vol. 20, July 1932, pages 579-581. Describes electrical equipment. Mill consists of 4 stands, each being of the 4 high type with 8½″ diam. working rolls and 25″ diam. backing-up rolls. Each stand is driven, through a reducing gear, by a 500 hp., 400-800 r.p.m., 230-volt adjustable speed mill motor. Tension-reel is driven by a 65 hp., 300-1200 r.p.m., 230-volt adjustable speed motor. Power is supplied by a 1250 kw. synchronous motor generator set. Ward-Leonard system of control is used. MS (17)

The Hollinger Assay Office. W. R. Dodge. *Transactions Canadian Institute of Mining & Metallurgy,* 1931, pages 239-246. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 317. AHE (17)

Continuous Process Plays Important Role in Manufacturing of Radiators. J. B. Nealey. *Automotive Industries,* Vol. 67, Sept. 10, 1932, pages 332-334. Description of the manufacture of radiators in the Fedders Mfg. Co., Buffalo, N. Y. plant. DTR (17)

Long Beach Plant Bonderizes Ford Steel Parts in Quantity. J. B. Nealey. *Automotive Industries,* Vol. 66, Apr. 1932, pages 592-593. Description of the bonderizing and assembly section in the Ford Motor Co. Assembly Plant, Long Beach, Calif. Bonderizing consists of putting the steel parts through a solution of Mn phosphate and Fe phosphate in water at 210° F. A layout for this process is somewhat complicated, for the steel parts must be carefully cleaned before bonderizing and then thoroughly dried in a gas-fired oven. Equipment for finishing, ovens, etc. take up more than half the space in this plant, the main building being 387 x 920 ft. Gas is the fuel used throughout. Fenders and other parts which are to be enameled are first put through the bonderizing process which prepares and rust-proofs steel. Complete details of bonderizing method are included. DTR (17)

The Electrical Laboratory of the V.A.W. Lautawerk. (Das Elektrische Laboratorium der V.A.W. Lautawerk.) H. Schmitt & F. Woehr. *Aluminium, Hauszeitschrift V.A.W. und Erftwerk,* Vol. 4, Apr.-June 1932, pages 112-114. The equipment consisting of motor-driven d.c. generators, single-phase generators and transformers and the distribution system is described in detail. All conductors and bus bars are of Al. Ha (17)

What the Bureau of Standards Does for Metallurgy. Richard Rimbach. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 65-70. The author describes the facilities of the Bureau of Standards in the study of fundamental problems in melting and casting of alloys, their composition, mechanical working of metals, their thermal and structural characteristics, their resistance to corrosion and other special properties. WLC (17)

British Cast Iron Research Association New Laboratory Extension. *Iron & Steel Industry & British Foundryman,* Vol. 5, Aug. 1932, pages 399-401. A description. CHL (17)

New Blast Furnace Plant at the Derwent Works of the United Steel Companies, Ltd. W. E. Taylor. *Iron & Coal Trades Review,* Vol. 125, July 29, 1932, pages 164-168. The charging operations are completely controlled electrically. A detailed description of the plant and its special features for opening and closing the bells, sealing against leakage of gas and charging gear are given. Ha (17)

Lincoln Car Made More Durable with Heat. *Heat Treating & Forging,* Vol. 18, July 1932, pages 430-434. Describes heat treating equipment. MS (17)

The Foundry Institute at the Technical University at Aachen. (Vom Aachener Giessereiinstitut.) *Die Giesserei,* Vol. 19, July 8, 1932, pages 261-262. Describes the new institute devoted to the technology of the entire field of foundry practice. Ha (17)

Handling Retorted Gold. *Engineering & Mining Journal,* Vol. 133, Oct. 1932, page 515. At the refinery of the Homestake Mining Co. at Lead, S. D., a red-hot cast Fe container is removed from the retort by a device minimizing the hazard of accident and discomfort to operators. The device and oil-fired retort are illustrated. The device is made of a 2″ standard cross piping, and other ordinary fittings, and is supplied with 3 hickory handles with an arrangement of Fe straps that permits easy attachment to the container. WHB (17)

MACHINERY & SUPPLIES (18)

Moving Materials by Conveyors. Charles A. Adams. *Blast Furnace & Steel Plant,* Vol. 20, Aug. 1932, pages 655-657. Illustrated description of recent installation for conveying sheets, strip, plates, etc. to and from rolling-mills, furnaces, shears, and similar equipment. MS (18)

A New Small Blower for Foundries. (Ein neues Klein- Gebläse für die Giesserei.) A. Karsten. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 26, 1932, pages 260-261. Description of a small blower, system Ako, for drying ovens, muffles and hardening furnaces, crucible furnaces and small cupolas. The blower is electrically driven, Silumin case, revolutions 5000-6000/min. GN (18)

Lifting Magnets in Plate and Sheet Mills. *Demag News,* Vol. 6C, July 1932, page C24. Brief description of magnet crane equipment. Ha (18)

Rational Grinding of Cutter Heads. (Rationelles Schleifen von Messerköpfen.) *Die Werkzeugmaschine,* Vol. 36, Aug. 31, 1932, pages 304-305. Illustrated detailed description of the latest construction of a universal tool grinding machine for millers, reamers, screw-taps, cutter heads and similar special tools. The single parts and supplementary tools are interchangeable. The machine is put on the market by R. Stock & Co., Berlin-Marienfelde. GN (18)

Flying Shears. (Fliegende Scheren.) *Demag Nachrichten,* Vol. 6, July 1932, pages C19-C21; *Demag News,* Vol. 6, July 1932, pages C19-C21. Detailed description of a high speed shear installed at a modern Czecho-Slovakian continuous strip mill. Similar shears for continuous billet mills also described GN + Ha (18)

Demag Electro-rollers with Stationary Axis. (Demag-Elektrorollen mit feststehender Achse.) *Demag Nachrichten,* Vol. 6, July 1932, page C 32. Data on power consumption, .189 kw./roller in one case. Costs of maintenance. GN (18)

Modern Working of Automobile Cylinders by Drilling, Grinding and Honing. (Neuzeitliche Bearbeitung von Automobil- und Motorenzylindern durch Bohren, Schleifen und Honen.) Weil. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Sept. 11, 1932, pages 478-479. Illustrated description of new construction of machines for the above mentioned purposes. Drilling and honing machines of the Hille Works, Dresden, combined drilling and honing machine of Mayer & Schmidt, Offenbach, honing machine by L. Kellenberger, St. Gallen and an internal grinding machine with honing equipment by Friedr. Schmaltz, Offenbach, are described. GN (18)

MISCELLANEOUS (20)

Present and Future Mechanisation of German Agriculture. (Die Mechanisierung der deutscher Landwirtschaft in Gegenwart und Zukunft.) Ernst Zander. *Stahl und Eisen,* Vol. 52, Mar. 3, 1932, pages 209-218. Includes discussion. A narrative description of the development of the use of mechanical appliances in German agriculture, especially since the World War. Progressive work is being carried out on both small and large scale farm tools, machinery and equipment. From 1927 to 1930 the use of steel in German agricultural work increased over 10%. Steel for agricultural machines and equipment stood in third place, 10.5% of all steel being used for this purpose. At the head of the list was steel used in boiler construction, 14%, thus showing the enormous market for steel in farm work, resulting from extensive research development and application. DTR (20)

Friction Between Wheel and Rail in Curves. (Die Reibung zwischen Rad und Schiene im Bogen.) Heumann. *Organ für die Fortschritte des Eisenbahnwesens,* Vol. 87, Mar. 1, 1932, pages 105-109. Critical discussion and mathematical correction of the previous Report of the Technical Committee of the Verein Deutscher Eisenbahnverwaltungen (*Organ für die Fortschritte des Eisenbahnwesens,* Vol. 86, Oct. 1, 1931, pages 391-410) with particular reference to the friction coefficient between wheel and rail in curves. EF (20)

Tungsten Carbide Tool Production. Correspondence from Samuel M. Howell. *Metals & Alloys,* Vol. 3, May 1932, page 112. The writer describes an alumino-thermic method of producing tungsten carbide alloys with Co and other metals. The mixed oxides of the metals required with the proper proportion of Al and C to give the desired alloy are finely ground and mixed .The mixture is charged into a refractory crucible inside a heavy steel casting closed to access by air and the charge fired electrically. A satisfactory alloy results. WLC (20)

Influence of Damping in the Elastic Mounting of Vibrating Machines. E. H. Hull. *Transactions American Society Mechanical Engineers,* Vol. 53, 1931, Applied Mechanics, pages 155-165. An investigation of elastic mountings for the prevention of transmission of vibration from electrical apparatus into the structure of buildings showed that the effectiveness of such support depends on the square of the ratio of the impressed disturbance to the natural frequency of the machine on its mounting; the latter must, therefore, be made as low as possible. Damping or internal friction causes an additional transmission through the mounting. The selection of proper materials in the supports according to the theory is shown in an example. Ha (20)

Variety of Citroen Steels and Heat Treatments Limited by Extensive Standardization Program. Jos. Geschelin. *Automotive Industries,* Vol. 67, Sept. 3, 1932, pages 290-293, 316. Summary and discussion of the specifications and heat treatments of the steels used in the manufacture of the French Citroen cars. The material is subdivided into 3 complete tables. DTR (20)

On the Penetration of Soft Bodies into Hard Ones. (Om mjuka kroppars inträngande i harda.) Carl Benedicks. *Jernkontorets Annaler,* Vol. 116, July 1932, pages 321-329. It is shown that soft materials, such as wrapping paper, green leaves, or fibers, make a definite imprint when compressed at 20-50 tons between plates of glass or hardened steel. In practice the same phenomenon was observed in cast Fe rolls used for smoothing paper with small knots in it. HCD (20)

When Weldings are Specified. G. B. Cramp. *American Machinist,* Vol. 76, June 23, 1932, pages 786-789. The proper preparation of drawings for weldings must be prepared to give adequate information to shop and mill. Examples illustrate the points in view. Ha (20)

Safe Loading of Steel in Boats. P. M. McArdle & A. V. Berquist. *Blast Furnace & Steel Plant,* Vol. 20, Aug. 1932, pages 646-647. Describes equipment used and methods of loading steel products such as pig-iron, skelp, billets, and plates. MS (20)

Influence of Variations of the Molecular Field on the Magnetic Properties of Substances. (Influence des Fluctuations du Champ Moléculaire sur les Propriétés Magnétiques des Corps.) E. Néel. *Annales de Physique,* Vol. 18, July-Aug. 1932, pages 5-105. To explain certain inexactitudes in the theory of magnetism of Langevin-Weiss a theory of the molecular field is developed on the hypothesis of the existence, in a crystal between 2 carriers of magnetic moment, of a potential energy which is a function of the distance and the relative position of the 2 carriers. The differences between the 2 Curie points can then be explained and the increase of specific heat above the Curie point expressed. The method of determining the magnetic moment and molecular field of all metals is derived. The paper must be referred to. Ha (20)

Iron Ore Deposits in Minas Geraes (Brazil). [Eisenerz-Vorkommen in Minas Geraes (Brasilien)]. Ernst Albrecht Scheibe. *Archiv für das Eisenhüttenwesen,* Vol. 5, Feb. 1932, pages 391-406. Report 28 of Ore Committee of Verein deutscher Eisenhuttenleute. Includes short discussion. The Minas Geraes province in Brazil has long been recognized as one of the richest iron ore districts of the world. In 1926 the total reserves were estimated at approximately 8,000,000,000 tons. The geology of the entire district, and the character and occurrence of the ores are described. The possibilities of greater development and utilization are discussed. 38 references. DTR (20)

Disposal of Rolling Mill Scale. V. A. Senrab. *Blast Furnace & Steel Plant,* Vol. 20, Aug. 1932, pages 643-645. Discusses design and lay-out of pits for the collection and disposal of scale. Scale trenches under mill stands and tables should have such slopes that with help of mill and furnace waste cooling H_2O, all scale will be carried to scale pit, located in the billet storage building. MS (20)

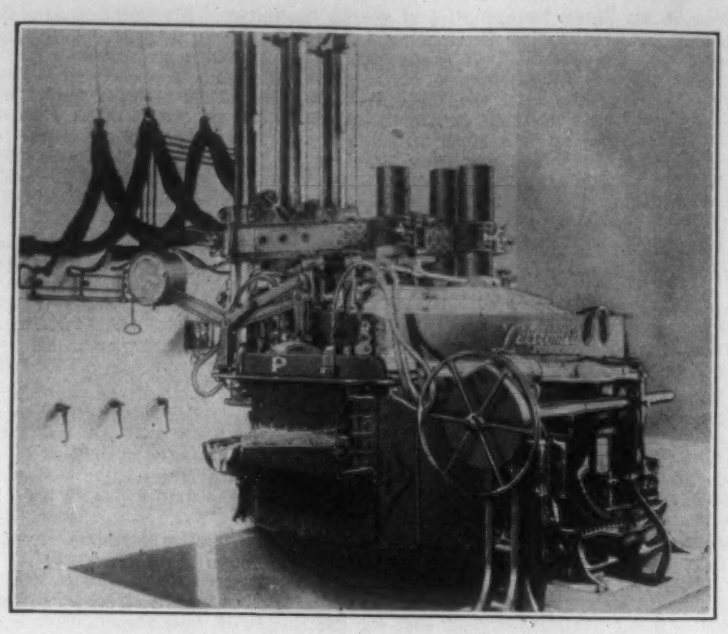
The Precipitation of Platinum-Black. (Ueber die Fällung von Platinmohr.) A. Sieverts & H. Brüning. *Zeitschrift für anorganische und allegemeine Chemie,* Vol. 201, No. 2, 1931, pages 113-121. A comprehensive study of the conditions of precipitation of Pt black from chloroplatinic acid by means of formic acid, sodium formate and formaldehyde. The nature and amount of contamination in Pt black prepared in different ways have been examined. With a chloroplatinic acid : sodium formate ratio of 1 : 2 Pt black is obtained free from gas. Ha (20)

Notch Effects. (Etwas über Kerbwirkungen.) G. Storz. *Automobiltechnische Zeitschrift,* Vol. 35, July 10, 1932, pages 324-325. Giving examples of screws with profiles of different shapes it is shown how greatly the danger of fracture can be diminished by properly choosing transitions in diameter, rounding of corners in crankshafts, etc. Ha (20)

Coöperation or Competition between Steel Founder and Welder. (Gemeinschaftsarbeit oder Konkurrenzkampf zwischen Stahlgiesser und Schweisser.) Stieler. *Giesserei,* Vol. 19, Apr. 1, 1932, page 127-128. The author develops his ideas for a closer coöperation between founder and welder, as undoubtedly welding methods have in late years made great inroads in the field of cast steel practice. He points out that in properly designing a piece to be cast and laying out large structures in steel a profitable coöperation between these 2 fields could be effected. For cast Fe parts, conditions are not yet as favorable as welding methods for cast Fe have not been developed as satisfactorily as for steel. Ha (20)

Velocities of Flow in Plastic Deformation and Their Reference Quantities. (Formänderungsgeschwindigkeiten der bildsamen Verformung und ihre Bezugsgrössen.) L. Weiss. *Zeitschrift für Metallkunde,* Vol. 24, June 1932, page 131. Formulae are given for the calculation of the following quantities, expressing velocity of flow in a unit of time: the decrease in height (thickness), the volume displaced and the percent height (thickness) or cross-section decrease. RFM (20)

Foundations—Pneumatic and Steam Hammer. E. L. Parry. *Heat Treating & Forging,* Vol. 18, July 1932, pages 415-416. Notes on construction. Contains table of safe loading values of soils. MS (20)



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FOUNDRY PRACTICE & APPLIANCES (22)

The Making of a Reversible Pattern Plate with a Sweep after the Hainholz Method. (Herstellung einer reversierten Modellplatte mit Abstreifkamm nach dem Hainholzverfahren.) ERNST EITER. *Die Giesserei,* Vol. 19, Aug. 5, 1932, pages 305-309. The production of a plate for a reversing pattern is described in detail
1 with several examples; this molding machine can be utilized for increased production. Ha (22)

Making of High Test Cast Irons by Superheating and Refining in an Induction Furnace of Normal Frequency. (La production des fontes de haute qualité par surchauffage et affinage au four à induction à fréquence normale.) ALBERT LEVASSEUR. *Journal du Four Electrique,* Vol. 41, Sept. 1932, pages 330-333. A comparison of economic efficiency of an arc and a cored induction furnace running on cupola metal. Operation is intermittent. Arc furnace is more flexible though slightly more expensive. Quality of Fe produced is the same. JDG (22)

Binding of Core Sands. (L'Agglomeration des Sables a Noyau.) MARCEL GUEDRAS. *Revue de Fonderie Moderne,* Vol. 26, July 10, 1932, pages 223-224.
2 The properties of binding agents for core sands are discussed; linseed oil is one of best and is base of many special binders of which few are mentioned Ha (22)

Metallography and Foundry—Introduction to the Scientific Study of Foundry Practice. (Métallographie et Fonderie—Introduction à l'étude scientifique de la fonderie). A. PORTEVIN. *Bulletin de l'Association Technique de Fonderie,* Vol. 6, Jan. 1932, pages 19-25. A general and comprehensive survey of the most important factors involved in foundry practice. Phenomena encountered in foundry are dealt with: castability of molten metal, shrinkage holes (piping), solid shrinkage, cracks, blowholes, segregations, macrostructure. Factors dependent upon: the metal, the pouring conditions, the mold, the casting (weight, thickness, etc.), the casting-mold contact. Table summarizing the various phenomena described and resulting defects. Concluding, the author emphasizes the necessity of the scientific
3 study of foundry practice, for instance, there is actually a lack of data concerning the properties of metals and alloys in the molten state and the relations existing between the foundry properties and the equilibrium diagrams. FR (22)

Foundry Factors in Design of Steel Castings. W. G. HEDNOWALT. *Journal Western Society of Engineers,* Vol. 37, Apr. 1932, pages 82-87. It is pointed out that a knowledge of foundry practice and an understanding of metal during the period of solidification and subsequent cooling has paid large users of steel castings both from an economic point of view and from the standpoint of satisfaction with the finished machine or product. Quite often the foundryman is confronted with the question of appearance of the steel casting as compared with the
4 difference in machinability. When one considers that the steel is poured at temperatures ranging from 2700° to 3000° F. depending on the nature of the piece being cast and that the fusion of the sand itself is not much above 3000° F. and the fusion point of all the bonding materials far below this point, one will appreciate that the sand temperature is raised almost to the temperature of the steel, fusion of the bond takes place and often the sand itself begins to fuse. The development of alloy cast steels has brought with it the art of treating castings by liquid quenching and drawing in order to obtain desired physical properties. GTM (22)

New Portable Sand Conditioner. (Nouveaux Préparateurs de Sable Mobiles.) R. EPPENBERGER. *Revue de Fonderie Moderne,* Vol. 26, July 10, 1932, pages 222-223. Description of a machine which sifts, cleans and mixes sand. Ha (22)

Relations Between Cupola Charge and Output. Its Effect on the Material Value
5 **of Liquid Iron. (Wechselbeziehungen zwischen Ofeneinsatz und Ausbringen. Ihr Einfluss auf den Wert des flüssigen Eisens.)** A. GEISSEL. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 4, 1932, pages 345-348. The paper shows the close relation between furnace charge and output and the extensive effect of these factors on the value of the liquid melt. Decreasing output raises the value of liquid Fe greatly. Normal amount of spoiled castings is of minor importance for the price of liquid Fe, a higher amount, however, makes it dearer. The amount of scrap should be as low as technically possible in order to improve the ratio charge : output. Loss through oxidation is to be limited to the lowest possible degree. This is shown in numerical examples. GN (22)

Operation of Cupola Furnaces. (Conduite des Cubilots.) GUY HENON. *Revue*
6 *de Fonderie Moderne,* Vol. 26, Aug. 10, 1932, pages 249-252. Some principal rules for the operation of cupola furnaces in preparing the charge, heating up, charging, sampling and emptying are discussed. Ha (22)

Evolution of the Foundry—Snap Molding. (Evolution de la Fonderie—Le Moulage Par Mottes.) M. CONSTANT. *Revue de Fonderie Moderne,* Vol. 26, July 10, 1932, pages 215-218. Shows development of molding practice. Ha (22)

New Type Deoxidizers Containing Phosphorus. (Neuartige Desoxydationsmittel mit Phosphor.) WILLI CLAUS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 377-378. The described new deoxidizers are briquettes of red amorphous P and Zn powder. Tests show that they are absolutely equivalent to the commonly used solid Cu-P deoxidizers as regards application. The following tensile tests on casting bronze, dry sand mold, after deoxida-
7 tion with P-Cu and P briquettes prove the favorable properties.

Deoxidizer	Yield Point kg./mm.^{2}	Tensile Strength kg./mm.^{2}	Elongation %
P-Cu (10% P)	11.96	16.68	7.6
P-briquettes (10% P)	12.72	21.20	16.6
P-briquettes (20% P)	12.12	22.85	20.5

Upon deoxidizing Cu, Ni, Sn-bronzes with P briquettes no detrimental effects through contamination of the melts with P or Zn need be feared when the addition of P briquettes is properly chosen. GN (22)

Handling and Storing of Foundry Sand. Metals and Materials Efficiently Resistant
8 **to Abrasive Action of Foundry Sand. (Manutention et Emmagasinage du Sable de Fonderie. Métaux et Matières Résistant Efficacement à l'Action Abrasive du Sable de Fonderie.)** J. R. DELIN. *Bulletin de l'Association Technique de Fonderie,* Vol. 6, Apr. 1932, pages 109-114. Includes discussion. Lecture before the Association Technique de Fonderie, Feb. 1932. Among materials resistant to abrasive action of foundry sand, the Ni-Cr steels are indicated (composition and properties are given). This kind of steel being easily welded, wearing parts are welded-on pieces. Stellite alloy is also mentioned. But owing to the high price of the latter, Ni-Cr steels are preferred. FR (22)

The Mixing of Synthetic Molding Sands by Means of Their Specific Surface. (Ueber das Gattieren synthetischer Formsande mit Hilfe ihrer spezifischen Oberfläche.)
9 E. DIEPSCHLAG & H. TEUBER. *Die Giesserei,* Vol. 19, Sept. 2, 1932, pages 342-346. It is pointed out that a molding sand should not be judged alone by the size of the quartz grains and the quantity of these grains contained in the sand; coarse grains are mostly quartz, fine grains clay. The methods of determining the grain sizes by sedimentation are described. In building up synthetic sands from grains of different sizes the properties were investigated as dependent on the surface of the grain and means are explained to classify sands according to their specific surface. Ha (22)

Core Blowing Machines: (Kernblasmaschinen.) ERICH BECKER. *Zeitschrift*
10 *für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 367-369. The paper first discusses the principle of core blowing machines. The difficulties first encountered in Germany in using American core blowing machines were due to different types of core sands. These difficulties could be eliminated. New German blowing machines are described. The advantages of such machines are discussed at length. In general, the permeability to gases of blown cores is essentially higher. Another great advantage is the possibility of using the core boxes common in hand molding. Modern core blowing machines offer the possibility, even for small foundries, to utilize the advantages of core making machines. GN (22)

FURNACES & FUELS (23)

Insulating Materials for Furnaces. (Isoleringsmaterial für ugnar.) JOHAN PALM. *Jernkontorets Annaler,* Vol. 116, Aug. 1932, pages 351-375. The common insulating materials are discussed, and their structural properties are compared with other building materials. 14 references. HCD (23)

Testing of a Pipe Welding Furnace Working on Cold and Hot Charge for Determination of the Efficiency of the Preheater. P. L. DITCH. *Domez,* No. 4-5, 1932, pages 55-68. In a pipe welding furnace holding 2 blanks the second was introduced when the first was removed in order not to cool the first. A preheater was installed in order to minimize the difference in the temperatures and to increase the production of the installation. A very detailed calculation of the thermal balance showed that the increase should be at least 25%. Actually it was 6%. Explanations for this discrepancy and the means for correcting the situation are offered. (23)

Modern Melting Furnaces. (Moderne Metallschmelzöfen.) H. REININGER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 378-382. The paper describes a great number of modern metal melting furnaces from the viewpoint of adaptability to various metals and melting capacities. Coke, gas and oil fired crucible furnaces of tiltable and stationary type, rotating and rocking melting furnaces of various constructions, electrically heated hearth furnaces, etc. are described. 7 references. GN (23)

Tests Show Wide Temperature Variations Inside Heat-Treating Furnaces. WIRT S. SCOTT. *American Machinist,* Vol. 76, Aug. 3, 1932, pages 898-901. See "Temperature Distribution in Industrial Furnaces," *Metals & Alloys,* Vol. 3, June 1932, page MA 186. Ha (23)

Hardening Furnaces Heated with Producer Gas. (Härteöfen mit Generatorgasbeheizung.) H. REPKY. *Werkstattstechnik,* Vol. 26, Aug. 15, 1932, pages 322-324. Furnaces for hardening high speed tool steel in salt or Pb are described. Furnace obtained a temperature of the liquid of 1350° C. with purified producer gas of 1250 kcal/m.^{3} gas and air preheated to 400° C. Heating up the furnace took 1-4 hours depending on the amount of fuel employed. Thermal efficiency was about 49%. RFV (23)

High Capacity Enameling Furnaces. (Hochleistungsemaillieröfen.) *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Mar. 10, 1932, pages 179-181; Mar. 17, 1932, pages 199-200. Detailed description of the enameling plants of the American Stove Co., Harvey; Enamel Products Co., Cleveland; Republic Stamping and Enameling Co., Canton; General Electric Co., Schenectady; Westinghouse Electric Mfg. Co., with special reference to the enameling furnaces. GN (23)

Large Car-Type Annealing Furnace Claimed to be Largest Built. *Iron & Coal Trades Review,* Vol. 125, Aug. 12, 1932, page 235. The furnace is used for annealing fusion welded pressure drums and steel equipment up to 2150° F. and is 18 x 18 x 87 ft. Ha (23)

The Annealing of Metal Strip in Continuous Furnace. (Ueber die Glühbehandlung von Metallbändern in Durchziehöfen.) O. JUNKER. *Zeitschrift für Metallkunde,* Vol. 24, July 1932, pages 162-164. Calculations of temperature cycles and comparison with measured temperatures. The effects of radiation and of surface are treated in detail. RFM (23)

Past and Present Sheet Annealing Furnaces. (Die Blechglühöfen in Vergangenheit und Gegenwart.) FRIEDRICH BLEIMANN. *Stahl und Eisen,* Vol. 52, Aug. 18, 1932, pages 797-806. The use of the first annealing furnace occurred only a few decades ago. The first type was the open-fire grate annealing furnace, coal-fired. Next came the semi-gas fired billet grate furnace, and then the hearth annealing oven fired with either semi-gas, coal, producer gas or powdered coal. The single-, double- and multiple-pot, canal, and continuous normalizing furnaces followed in order. Different types are shown diagrammatically, together with general overall dimensions, details of annealing by each method, performance, and good and bad points. DTR (23)

Steel Recuperators for Mixer Heating. *Demag News,* Vol. 6, Mar. 1932, pages C13-C15. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 358. Ha (23)

Heat Transfer in Recuperators. W. TRINKS. *Heat Treating & Forging,* Vol. 18, July 1932, pages 425-427. Curves for coefficient of heat transfer by convection and coefficient of heat transfer by gaseous radiation are presented and examples illustrating their use in calculating heat transfer in recuperators are given. MS (23)

The Use of Coal in the Melting and Heating of Metals. R. J. SARJANT. *Metallurgia,* Vol. 6, Sept. 1932, pages 149-152. General discussion of the subject in which comparative costs are cited. JLG (23)

Mechanical Stokers for Metallurgical Furnaces. CLIFFORD ARMSTRONG. *Iron & Coal Trades Review,* Vol. 125, July 1, 1932, pages 10-11. The reduced fuel consumption possible through use of automatic stokers in metallurgical furnaces is discussed and the advantages are pointed out, especially the cleanliness and the labor saved. Ha (23)

Development of Construction and Operation of Pusher-Furnaces in Upper Silesia. (Entwicklunglinien des Baues und Betriebes von Stossöfen in Oberschlesien.) FRITZ WESEMANN. *Stahl und Eisen,* Vol. 52, Apr. 7, 1932, pages 333-339. Report 161 of Heat Section of Verein deutscher Eisenhüttenleute. Furnaces fired with producer gas and high volatile coal (30 to 35% volatile matter) predominate in the Upper Silesian mills. In these furnaces heat transfer to the charge is closely related to the maximum length of flame, which may be controlled by proper adjustment of the rate of flow of fuel gas and air into the combustion zone. The amount of excess air is more important than the amount of gas: by throttling down the excess air from 20 to 90% of the theoretical air required, the flame length was increased from 1 to 15 m. Previous construction of furnaces, especially with respect to leakage losses, resulted in decreased air velocities. Gas-air mixtures were given maximum agitation through the different types of burners developed. Appreciable improvement was obtained by air preheating, which imparted maximum velocities to air or gases. Regulation between supply of fuel, air and stack draft had to be improved. Wide and direct combustion, usually common in the past, was abandoned in semi-gas furnaces. With the development of semi-gas operation, careful control of the secondary air supply was possible. Production was increased, while heating periods and fuel requirements were cut down by these changes, both with producer gas and grate furnaces. New installations and necessary alterations in the equipment were all made at low costs. DTR (23)

The Heats of Combustion and Formation of Carbon Monoxide and Methane. (Die Verbrennungs- und Bildungswärme von Kohlenoxyd und Methan.) WALTER A. ROTH & HILDEGARD BANSE. *Archiv für das Eisenhüttenwesen,* Vol. 6, July 1932, pages 43-46. The heats of formation and combustion of CO are highly important for every metallurgical furnace, for in the blast furnace the major part of the Fe ore reduction is done indirectly by CO. Similarly CH_4 plays an important part in coke oven gas or in gas mixtures of blast furnace and coke oven gas, as used in firing open-hearth furnaces. The writers considered it worth while to check the original values as determined by Thomsen and Berthelot. A detailed description of the bomb and apparatus is given. A completely metal bomb was used, the CO and CH_4 being burned at constant volume. Values were compared with those of Rossini, *Bureau of Standards Journal of Research,* Vol. 6, 1931, page 36. Heat of formation of CO_2 at 20° C. and constant pressure was + 67.70 kcal./mol.; of CH_4 at same conditions, with only water formed + 213.0 kcal./mol.; of CH_4 at same conditions, with all water vaporized at 20° C., + 191.9 kcal./mol. The heat of formation of CO from ordinary graphite at 20° C. and constant pressure was + 26.57 kcal. and of CH_4, + 17.97 kcal. DTR (23)

Changes When Preheating Mixed Gas. WALTER ALBERTS. *Blast Furnace & Steel Plant,* Vol. 20, May 1932, pages 417-419; June 1932, pages 510-511, 514; July 1932, pages 582-583. After a theoretical discussion of the dissociation of CH_4, equilibrium of CO_2, CO, and C, and formation of H_2O, results of tests made on a 200-ton tilting open-hearth furnace are given. Analysis of mixed and heating gases and temperatures of heating gases and bricks of slag chambers are given tabularly. Results indicate that sufficient dissociation of CH_4 takes place only at heating-gas temperature above 1200° C., corresponding to a minimum brick temperature of 1100° C. Reduction of CO_2 by C does not decrease as rapidly with falling temperature as decomposition of CH_4. No important action of infiltrated air took place. Actual CO content of heating gas was close to theoretical content calculated from reduction of CO_2. Only a maximum of 65% free C can be obtained (under influence of reduction of CO_2) from a mixed gas with 5% CO_2 and 12% CH_4 regardless of how high the preheating and assuming 100% decomposition of CH_4. Due to dissociation of CH_4 and reduction of CO_2, volume of heating gas per 1% dissociated CH_4, and entrance speed become greater by 2.5% than would be the case if using producer gas at equal entrance transverse sections. Changes of calorific value are shown. MS (23)

Metallurgical Furnaces Fired With Gas. (Ferngasbeheizte Hüttenwerksöfen.) F. WOLFF. *Die Wärme,* Vol. 55, Jan. 30, 1932, pages 69-73. The remarkable advance in metallurgical furnace heating technique due to the utilization of high-pressure gas carried over long distances is considered at length with regard to improvement of the gas combustion, reduction in costs for heating the furnace charge and simplification of furnace construction. Some characteristic metallurgical furnaces representative of this novel trend in furnace heating in Germany are illustrated and described in detail. EF (23)

Industrial Furnaces. Recent Developments in Gas Firing. Use of Blast Furnace Gas. F. JOHNSTONE TAYLOR. *Iron & Steel Industry & British Foundryman,* Vol. 5, Apr. 1932, pages 269-272, 276. Various types of furnaces and burners are described. For temperatures up to 1400° C. recuperative gas-fired furnaces are relatively cheap and call for little attention. The push type furnace with gas fed from the top is applicable when dealing with a large number of parts of approximately the same size. For relatively small plants the self-contained producer and furnace is a compact arrangement. Furnaces for normalizing sheet and Sn plate are exacting in their requirements. They must deliver work flat, unmarked and unoxidized. Recent soaking pit designs call for blast-furnace gas as fuel. CHL (23)

Industrial Furnaces for Gas. XVII. Ovens in the Electrical Industry and for Heat Treating. LAWRENCE E. BIEMILLER. *American Gas Journal,* Vol. 137, Oct. 1932, pages 25-27. Ovens are extensively used in the electrical industry for baking enameled wire, insulating varnishes and compounds, and for metal finishes. Specific oven types are cited. Low temperature heat treating operations discussed: annealing of Al, preheating for welding, and heat treating of Zn slabs. CBJ (23)

The Effect of Furnace Design on Scale Formation. H. C. ARMSTRONG. *Engineer,* Vol. 153, June 3, 1932, page 608. Thorough mixing of furnace gases is the most important factor in preventing formation of scale on steel. There is greater necessity for proper mixing of gases in small furnaces than in those of larger size. 3 furnace designs are shown. The most efficient type is a special patented furnace in which part of the waste gases are recirculated through the combustion chamber. An even temperature is maintained throughout the furnace without excessive heating in the preliminary combustion zone. Various other types of gas-fired furnaces are discussed. LFM (23)

A Study of the Efficient Use of Blast Furnace Gas in Metallurgical Plants. (Contribution à l'étude de l'emploi rationel du gaz de hauts-fourneaux dans les usines métallurgiques. La combustion du gaz sous pression variable.) J. MARTIN. *Revue de Métallurgie,* Vol. 29, Oct. 1932, pages 485-491. Due to the character of the blast furnace operation, a continuous flow of the gas under constant pressure is impossible. For its best utilization, a proper amount of air must be added. For the largest gas consumers in a metallurgical plant, hot blast stoves and boilers, an automatic regulator of the combustion air is recommended and described. A membrane activated by the pressure of the incoming gas directly drives, through a system of levers, the valve regulating the air supply. Structural features of the arrangement are given. (23)

Lincoln Car Parts Heat Treated with Gas. J. B. NEALEY. *Iron Age,* Vol. 128, Dec. 31, 1931, pages 1667-1669. The heat treating department of the Lincoln Motor Co. is described. See "Heat Treating Department of a Modern Manufacturing Plant," *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 354. VSP (23)

Continuous Gas Ovens Bake Enamel on Trim and Moldings. J. B. NEALEY. *Automotive Industries,* Vol. 67, July 1932, pages 16-17. The continuous gas ovens at the Randall Co., Cincinnati, O., are described. The raw materials consist of rubber, rattan or reed, strip steel, and the finished products are roughly divided into 3 groups: (1) rough molding; (2) door trim and panel binders; and (3) upholstery molding. These gas ovens are constructed of sheet steel, and are well insulated. The oven is automatic and continuous in operation, both as to the baking period and temperature control. DTR (23)

Malleableizing Furnaces and Efficiency. (Temperöfen und Rationalisierung.) O. BRAUER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, May 15, 1932, pages 193-196. The profitableness of various types of malleableizing furnaces under slack business conditions is considered. Under the conditions given an old type malleableizing furnace with semi-gas heating proved best. GN (23)

Adapting a Coke Plant to Changed Operating Conditions for Decreased Rate of Production. (Anpassung der Kokerei an veränderte Betriebsverhältnisse bei sinkendem Beschäftigungsgrad.) KURT SKROCH. *Stahl und Eisen,* Vol. 52, Sept. 1, 1932, pages 849-852. The decreased production in an Upper Silesian plant, with consequent removal of blast-furnace gas supply, forced the entire plant to run on straight coke-oven gas. The Selas-A.-G.-high pressure gas burners, used for the mill furnaces, were changed over to run on coke-oven gas by simple replacement of orifices. The coke ovens were fired with a lean gas made out of coke breeze. Operating results and costs in the gasification of this coke breeze, 0 to 12 mm., are tabulated. DTR (23)

A Modern Coke Oven Heated by Blast Furnace Gas. *Industrial Chemist,* Vol. 8, Aug. 1932, pages 283-286. A detailed description is given of the scheme used at the works of John Lysaght, Limited, for heat conservation, in the manufacture of steel. The original plant, the additional plant and the advantages secured are discussed. RAW (23)

Cupola Heated with Oil. (Cubilot chauffé a l'Huile.) DELCROISETTE. *Revue de Fonderie Moderne,* Vol. 26, Aug. 25, 1932, pages 270-272. The construction of a cupola furnace with oil-firing is described where the air is preheated in the cupola. The thermal efficiency of the furnace was 42% while a similar furnace heated with coke was only 24%. The fuel cost is higher for the oil furnace but this is counterbalanced by a greater simplicity of charging and operating, an increase in production and a better quality of product. Ha (23)

Industrial Electric Heating. R. A. THWAITES. *Electrical Review,* Vol. 110, June 17, 1932, page 900. Applications of electric heating in heat treatment of metals and in brass and steel melting are reviewed briefly. MS (23)

The Prospects and Possibilities of the Standardization of Industrial Electric Furnaces for Finishing Goods. (Ueber Aussichten und Möglichkeiten der Normung elektrischer Industrieöfen für Weiterverarbeitung.) V. PASCHKIS. *Elektrowärme,* Vol. 2, Aug. 1932, pages 173-178. Suggestions are made for a generally adopted terminology in the practice of electric heating and a list of terms with definitions is drawn up. Guarantee tests, control and regulation, and stored heat and safety are discussed and recommendations made for standardization of construction details. Ha (23)

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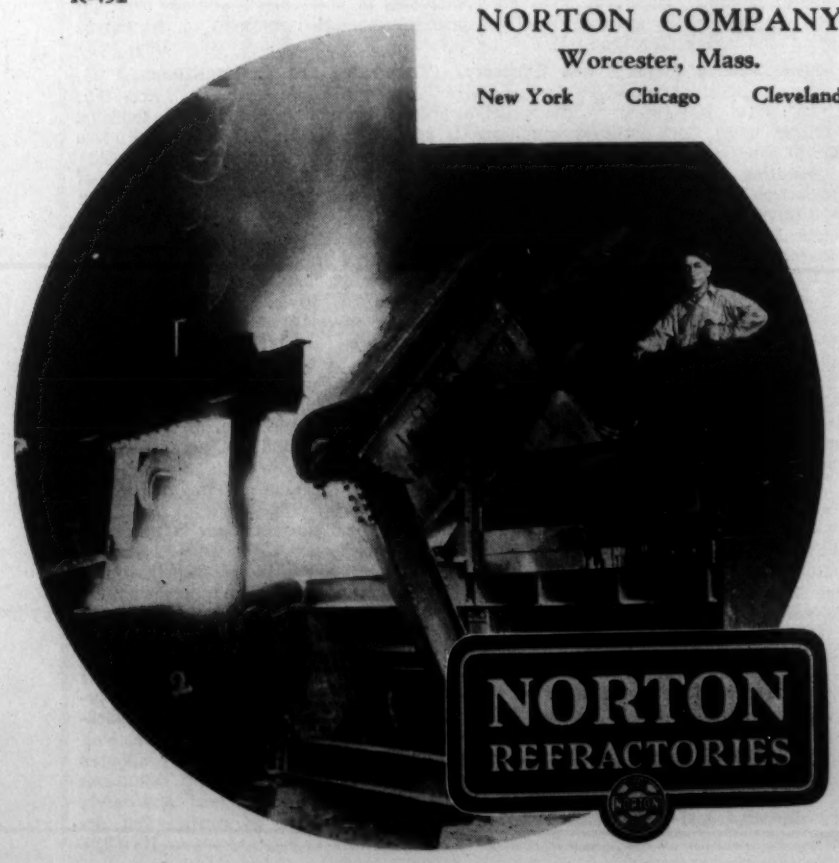

REFRACTORIES & FURNACE MATERIALS (24)

Refractory Materials. ALEXANDER H. HAYES. *Blast Furnace & Steel Plant.* Vol. 20, July 1932, page 611; Aug. 1932, pages 675-676. From *World Power.* See *Metals & Alloys,* Vol. 3, June 1932, page MA 187. MS (24)

1 **The Use of Alumina for Refractories. (Die Verwendung der Tonerde für hochfeuerfeste Zwecke.)** *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Feb. 18, 1932, pages 115-116. With the common raw materials for refractory bricks (clay, kaolin, fired slate-clay, etc.) higher contents than 44% Al_2O_3 cannot be attained. Higher contents can be obtained by the use of bauxite. Fire clay bricks with bauxite proved successful. They generally contain from 55% to 60% Al_2O_3. Such bricks have been used in France for hearth and bosh of blast furnaces. Bauxite is also the raw product for making pure Al_2O_3, either by chemical process or melting. Molten Al_2O_3 is denser and harder though not so pure as chemically made Al_2O_3, and therefore better for grinding purposes. GN (24)

2 **Refractories in the Foundry. (Les Matériaux Réfractaires en Fonderie.)** J. MATEJKA. *Revue de Fonderie Moderne,* Vol. 26, July 10, 1932, pages 218-221. The properties required of refractories used for lining foundry furnaces are discussed. They have to stand temperatures up to 2000° C. The most frequently used materials (silicates, alumina) are described and general directions for their use as lining material given. 9 references. Ha (24)

3 **Slovakian Magnesites. (Slovakische Magnesite.)** A. STRASSER. *Feuerfest-Ofenbau,* Vol. 6, June 1931, pages 81-84. Magnesia bricks used in metallurgical plants must have been fired in such a manner as to completely finish the recrystallization and sintering process. This can only be achieved if a minimum content of Fe_2O_3 is present. With reference to metallurgical practice, magnesite bricks with 5-7% Fe_2O_3 are best suited showing great stability against softening and low shrinkage. The manufacture of Slovakian magnesite bricks in the new Lovinobana Plant is described which meets the requirements stated above. The analysis is: 86.54% MgO, 6.67% Fe_2O_3, 3.19% SiO_2, 1.97% CaO, 1.46% Al_2O_3, 0.18% loss on ignition. EF (24)

4 **Iron Compounds as Catalysts in the Conversion of Kaolinite into Mullite and Quartz into Tridymite. (Eisenverbindungen als Mineralisatoren beim Umwandeln von Kaolinit in Mullit und Quarz in Tridymit.)** P. P. BUDNIKOFF & W. G. POPOFF. *Feuerfest-Ofenbau,* Vol. 7, Oct. 1931, pages 145-146. The mullite formation at the outside of chamotte refractory bricks was ascribed to Fe compounds from fuel ashes. New microscopic investigations revealed the catalytic action of Fe compounds in (a) the transformation of kaolinite into mullite in a chamotte brick and (b) of quartz into tridymite in a silica brick. Additions of Fe bearing materials, for instance 2-3% of open-hearth, Bessemer or foundry slag or blast furnace throat dust to the raw material for silica bricks also promote the conversion. This phenomenon is associated with a gain of physical strength and with an improvement of the chemical resistance of open-hearth roofs. EF (24)

5 **Brown Silica Bricks prolong the Life of Open Hearth Refractories. (Schwardinas braune Silikasteine verlängern die Martinofenreise.)** *Feuerfest-Ofenbau,* Vol. 8, March 1932, pages 9-10. Note on the longer life times of open hearth silica bricks achieved by P. Budnikow & I. Smeljanskij due to additions of Fe containing catalysts (see abstract above) which promote the conversion of quartz into tridymite. Silica material to which 2% open hearth slag, 2% lime and charcoal powder was added, withstood 450 melts. EF (24)

6 **Preparation and Shaping of Refractory Materials in Germany. (Aufbereitung und Formgebung feuerfester Materialien in Deutschland.)** O. PHILIPP. *Feuerfest-Ofenbau,* Vol. 8, June 1932, pages 81-89; July 1932, pages 101-104; Aug. 1932, pages 113-119. The abundantly illustrated paper gives in great detail the (a) dressing of the principal refractory materials, including crushing, screening, sifting and blending and (b) the shaping of plastic and non-plastic refractories with reference to German practice. EF (24)

Refractory Cements and Refractory Mixes. ROBERT W. KNAUFT. *Fuels & Furnaces,* Vol. 9, Dec. 1931, pages 1371-1374, 1380. Cements for use up to about 1800° F. are usually made of mixtures of raw and burnt fireclay with additions of sodium silicate, asbestos, lime, salt or Portland cement. For higher temperatures up to 3300° F. finely ground silicon carbide, chrome ore or mullite are mixed with asbestos, plastic clay, etc. Plastic refractories, a term designating material shipped in a moist condition ready for use by ramming directly into place, consist of fireclay mixtures. The manufacture of mullite, $3Al_2O_3 \cdot Si_2O_3$, from its constituent oxides or from sillimanite, cyanite or andalusite is sometimes accomplished in the cement after its application in the furnace. Compact tamping and surface roughening to receive further layers are important in making furnace repairs. CMB (24)

7 **Economies of the Use of Refractories.** *Blast Furnace & Steel Plant,* Vol. 20, June 1932, pages 512-514; *Heat Treating & Forging,* Vol. 18, July 1932, pages 428-430. In a steel mill, the standard for measuring performance of furnace linings is the refractory cost per unit of operation. Knowledge regarding tonnage produced in time operated is usually available, but that relating to cost of refractories is frequently indefinite. When all items entering into the cost of brick work in place are known and standardized then the means are at hand to determine methods of reducing costs. Factors entering into material cost which can usually be studied to advantage are type and shape of material; salvage value of dismantled materials, and turnover, inventory and obsolete material. Factors entering into labor costs which can be studied are unloading into storage; delivery of material from storage; dismantling old brick work preparatory to rebuilding or relining furnace; mason labor; and helper labor. MS (24)

8 **Developments in Unburned Magnesite Brick.** A. E. FITZGERALD. *Blast Furnace & Steel Plant,* Vol. 20, Aug. 1932, pages 658-660, 666. See *Metals & Alloys,* Vol. 3, June 1932, page MA 187. MS (24)

9 **Specific Resistance of Highly Refractory Oxides in Electric-Furnaces. (Spezifischer Widerstand hochfeuerfester Erdoxyde im elektrischen Ofen.)** G. SIMON. *Feuerfest-Ofenbau,* Vol. 8, May 1932, pages 72-73. According to his Doctor Thesis, the writer concludes that the stable monoclinic ZrO_2 displays a greater resistance than the meta-stable tetragonal modification. The genesis of a stable cubic modification must also depend on further conditions besides the presence of 1.4% MgO and a temperature of 1700° C. The utilization of ZrO_2 as furnace material in the Helberg and high-frequency furnace is possible from an electrotechnical viewpoint. EF (24)

GASES IN METALS (25)

Solubility of Oxygen in Iron. (Zur Frage der Sauerstofflöslichkeit im Eisen.) HANS ESSER. *Zeitschrift für anorganische und allegmeine Chemie,* Vol. 202, Dec. 15, 1931, pages 73-76. The maximum saturation concentration of O in Fe in the temperature range 0°-1500° C. is under 0.02%. FeO is one of the substances least soluble in Fe. Ha (25)

10 **The Kinetics of the Reaction H_2 (Gas) $\rightleftharpoons$ 2 H (dissolved in Palladium). [Über die Kinetik der Reaktion H_2 (Gas) $\rightleftharpoons$ 2 H (gelöst in Palladium).]** C. WAGNER. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 159, May 1932, pages 459-469. The changes in the hydrogen concentration in Pd-wire in relation to the time at a certain hydrogen pressure only depend on the reaction at the phase boundary. The reaction velocity greatly depends on uncontrollable influences. In conclusion the author discusses at length previous investigations of E. W. R. Steacie & F. M. G. Johnston (*Proceedings Royal Society,* Sec. A, Vol. 112, 1926, page 542) dealing with the absorption velocity of oxygen by Ag-foil. 11 references. EF (25)

EFFECTS OF ELEMENTS ON METALS & ALLOYS (27)

Investigation of the Effect of Phosphorus in Wrought Iron. J. H. Higgins. *Proceedings American Society for Testing Materials,* Vol. 30, 1930, Part I, pages 170-184. Complete test data are reproduced showing that the tensile strength and yield point of Fe with 0.059-0.452% P is increased and elongation and reduction of area decreased with an increase of P content. Vibratory tests also show an increase in vibrations before failure with increasing P content; as this is contrary to general experience this point requires further clarification. Ha (27)

Molybdenum—Today and Tomorrow. J. L. Gregg & H. W. Gillett. *Metals & Alloys,* Vol. 3, Apr. 1932, pages 98-104. The authors discuss the addition of Mo to structural steels containing various other alloys to decrease temper brittleness, increase depth of hardening, allow of machining at high hardness values and contribute to resistance to wear. Ni-Mo and more recently Mn-Mo steel have been successfully applied in the case carburized condition. The decided effect of Mo on the creep in high temperature service is being widely taken advantage of in steels for such service. Mo is being used successfully as a partial or complete substitute for W in high speed steels. It is finding increased use to advantage in valve steels, stainless steels and special tool steels. Very desirable properties have been obtained in cast steel and Fe by the addition of Mo. Compositions and properties of such cast materials are cited in the discussion. 51 references. WLC (27)

The Influence of Copper in Cast Iron. J. E. Hurst. *Iron & Steel Industry & British Foundryman,* Vol. 5, June 1932, pages 319-324; July 1932, pages 363-368. A detailed review of previous investigations relating to Cu in cast Fe. The author's experiences and tests confirm many of the earlier findings. Shrinkage values and depth of chill are lowered. Its effect, though more moderate, is similar to that of Ni. Hurst studied properties of cast Fe test rings containing 0, 0.70, 1.41, 1.81 and 3.06% Cu in accordance with methods and details laid down in B. E. S. A. Specification for Aircraft Material 4K6. Breaking strength was not affected, the modulus of elasticity was slightly increased, and Brinell hardness was decreased except for sample with 3.06% Cu. Copper-Cr cast Fe with 0.43 to 1.60% Cu and 0.57 to 1.25% Cr were investigated. Cu counteracts the hardening effect of Cr. Hardening and tempering tests were not sufficiently comprehensive to predict the influence of increasing Cu content on the hardening properties. The properties of the austenitic cast irons containing 14-15% Ni, 7% Cu, and 1.30 to 7.7% Cr were examined. Particularly useful because of their corrosion resistance. Cr increases the hardness, the strength and modulus of elasticity and decreases the magnitude of permanent set. Up to 4.21% Cr the material is machinable. The equilibrium relations of Fe-Cu-C are reviewed. CHL (27)

The Effect of Lead, Nickel, Bismuth and Zinc on the Properties of Tin Base Bearing Metals. (Einfluss des Bleies, Nickels, Wismuts und Zinkes auf die Eigenschaften der Zinnlagermetalle.) R. J. Snelling. *Die Metallbörse,* Vol. 22, Apr. 30, 1932, pages 546-547. Pb improves the elongation value and consequently the resistance against sudden and great pressure changes. Although the Pb content in Sn bearing metals runs as high as 0.75% in the U. S. A., the author is inclined to deny an improvement of physical properties above 0.25% Pb. The writer strongly contradicts the opinion that high Pb contents (up to 1.5%) impair the corrosion resistance to alkaline lubricants and result in decidedly inferior physical properties. A table is included showing the chemical composition, casting temperatures, annealing temperatures and Brinell hardness of 9 different bearing metals containing Pb. The best properties are ascribed to the following alloy: 90.8% Sn, 4.1% Sb, 3.8% Cu, 1.02% Pb, while the second best alloy runs as follows: 87.3% Sn, 7.5% Sb, 4.6% Cu, 0.62% Pb. The opinions on the effect of Ni are still divided. Since Ni easily alloys with Cu, the Cu-Sn constituent important in bearing metals is suppressed. The effect of Ni appears to be of a negative nature. Bi, occasionally used as a flux, increases the hardness without increasing the brittleness. Up to 0.25% Bi the friction resistance of Sn-rich white bearing metals is favorably affected. The following analyses are included in the paper:

	Sn	Sb	Cu	Bi	Zn
Bearing Metals for dynamos	88	8.0	3.5	0.5	....
Karman Bearing Metal	85	5.0	3.6	1.6	1.4
Motor Bronze	84	7.5	7.5	1.0	....

Fe is decidedly detrimental. Zn increases the hardness and brittleness. Nevertheless some continental railroad and steamship companies prescribe Zn bearing metals for heavy duty. EF (27)

The Effect of Chromium on the Transformation of Carbon Steels. (Ueber den Einfluss des Chroms auf die Umwandlungen der Kohlenstoff Stähle.) Franz Wever & Werner Jellinghaus. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, Report 204, 1932, pages 105-118. An extensive summary of the literature is given together with a review of the 3-phase system Fe-Cr-C. A series of thermal analyses by Wever and Engel's method. (*Mitteilungen Kaiser Wilhelm Institut für Eisenforschung,* Vol. 12, 1930, pages 93-114) was carried out on 55 Cr steels, varying in Cr content from 0.40 to 5.00%. The significant temperature points Ac_1, Ac_2, Ac_3, Ar_1, Ar_2, and Ar_3 were obtained from the differential-temperature and elongation curves. Then the Cr steels were divided into 5 groups, containing 0.5, 0.75, 1, 2, and 3% Cr, the C running between 0.03 and 1.37%. For each of these 5 groups for varying cooling rates, the A_1, A_2, and A_3 points, the average conversion temperatures and martensite points and varying structures were all derived and tabulated in order. In addition, 1 steel containing 2.05% Cr, 0.84% C, was examined by the Wever and Jellinghaus dilatometric method for observing the kinetics of the austenite decomposition. The summary of results is given below. (1) The carbides of Cr steels, containing up to 2% Cr, have the crystal structure of cementite, which checks the work of Westgren, Phragmén and Negresco. For crystals having approx. 3% Cr, a trigonal carbide was observed along with that of cementite; (2) the temperatures of the A_1 point increased with rising Cr-content; (3) the critical rates of cooling were depressed by addition of Cr, that is, the rates were lower than those for C steels. A new transformation was found for super-critical rates of cooling along with the formation of martensite, this new conversion lying between 530° and 430° C., depending on the C-content. The temperature of this conversion is not appreciably affected by the cooling rate; on the contrary, its intensity is diminished with increasing rates of cooling, also favorable towards martensite formation. The martensite conversion temperature for the Cr steels examined was almost the same as for C steels. (4) The austenite conversion proceeded in a different way in 3 temperature stages. In the first stage of the conversion a pearlitic structure was found, which with increasing cooling rate was gradually changed over into dark-etched quenched troostite. In the next stage the austenite is converted into a needle-like structure, which may be differentiated from martensite only by the stronger attack by the etch and which at higher temperatures of formation is similar to a fine-grained annealed troostite. (5) According to the structure analysis during pearlite conversion a cubical-space centered α-Fe is formed, the parameter of which is the same as that of C-free Cr ferrite. In the second stage α-Fe is again formed with an unchanged parameter, and the C content therefore can be only very small, just as that of the pearlite-ferrite. In the third stage tetragonal martensite is produced, the same as is formed for C steels. (6) Dilatometric tests at constant temperatures show that the kinetics of austenite transformation in the 3 different stages are determined by the same laws that apply in the case of the previously investigated Cr-Ni steels. 14 references. DTR (27)

Austenitic Gray Cast Iron. (Les Fontes Grises Austenitiques.) M. Ballay. *La Fonderie Belge,* Vol. 1, Nov. 1931, pages 127-132; Dec. 1931, pages 148-155. Lecture at Liege, May 30, 1931, before the Association Technique de Fonderie de Belgique. See "Some Properties of Austenitic Gray Cast Iron," *Metals & Alloys,* Vol. 2, Dec. 1931, page 323. FR (27)

Prevention of Liquation in White Antifriction Alloys by Addition of Nickel. A. M. Bochvar, F. P. Borin & M. Yoselevich, *Tsvetnuie Metallui,* July 1931, pages 850-854. Ni was found to prevent liquation and to insure uniform distribution of hard crystals in Sn-Sb alloys. Experiments showed that 1 to 2.5% Ni entirely prevents liquation and creates a uniform distribution of hard crystals of β solid solution of Sn and Sb. Ni, which forms a compound Sn_3Ni_2 with Sn, forms needles uniformly distributed throughout the alloy. Ni also increases the hardness of the alloy. The mechanical properties of this alloy and the effect of other elements, such as Co, Mn, Cd, Cr, Mg and Al on Sn-Sb, Pb-Sb and Sn-Pb-Sb alloys are now being investigated and will be reported later. BND (27)

Unmelted Graphite Residue in Cast Iron and Influence of Lead and Zinc. (Unaufgeschmolzene Graphitreste im Gusseisen und ihre Beeinflussung durch Blei und Zink.) Walter Bading, Erich Scheil & Ernst Hermann Schulz. *Archiv für das Eisenhüttenwesen,* Vol. 6, Aug. 1932, pages 69-73; *Mitteilungen aus dem Forschungsinstitut der Vereinigte Stahlwerke Aktiengesellschaft Dortmund,* Vol. 2, No. 2, 1932, pages 249-262. Report of the Research Institute of the Vereinigte Stahlwerke, A.-G., Dortmund. Literature on the subject is reviewed and summarized. A cast Fe containing 3.48% C, 3.06% graphite, 1.69% Si, 0.58% Mn, 0.404% P, and 0.082% S was used for making a count of the number and magnitude of the graphite nucleus, according to Tammann's method. The graphite, present in long thin flakes, was made uniform throughout by using only the center part of a cast plate 500 x 500 x 200 mm. for making the melt. Tammann and Dreyer's method was used for studying the effect of Pb and Zn. The results are given in the following table:

Temperature of Heat °C.	Variable Investigated	Nuclei Number per mm.³
1250	Superheating Temperature	150.6
1300		81.2
1400		18.5
1500		10.5
1300	Superheating Period	28.9
1300		9.9
1250	White Fe	34.5
1300		20.7
1300	Pb addition	30.2
1300	Zn addition	295.1
1300, white		30.5
1500		12.4
1300, 1 hr.		15.1
1300	ZnO addition	65.0
1300	ZnO + Pb addition	142.8

The number and size of the graphite nuclei in 1 mm.³ of the cast Fe was calculated from the count and measurement of the range of eutectic graphite shown by a polished section. Melting tests show that the number of the nuclei, as to be expected, decreased with increasing superheat temperature and superheat period. A straight-line relation was found between the logarithm of the nuclei number and the ratio of the superheat to the melting temperature. A charge of a white pig Fe, mechanical agitation of a liquid cast Fe by melting in a high frequency induction furnace, and addition of Pb all gave considerably lower nucleus numbers. Addition of Zn arrested the melting down of the graphite residue. With simultaneous additions of Zn and Pb, the effect of the Zn outweighed that of the Pb. A spontaneous graphite nucleus formation did not take place for any of the different conditions used in the tests. 14 references. Ha + DTR (27)

Nickel and Its Use as Additions in Steels and Cast Irons. (Le Nickel et son Emploi en Additions dans les Aciers et dans les Fontes). L. Bovet. *Arts-et-Métiers,* Nov. 1931, pages 453-458. Metallurgy of Ni; treatment of Canadian and New Caledonian ores is summarized. Properties and applications of pure Ni are cited. (1) Ni additions in steels, case hardened steels contain 2-7% Ni and mild and semi-hard steels 1-5% Ni. Very often Ni is added together with other elements, chiefly Cr. Strength and elastic limit of steel are increased 3 kg./mm.² for each 1% Ni addition in the annealed state but the increase is greater in the quenched and tempered state. Ni lowers the critical range and the quench critical rate so that cracks are minimized and depth of quenching is greater. Cr acts in same way but with too high Cr additions steel can become brittle. In case hardened steel, Ni decreases tendency to grain growth. Austenitic steel contains 8-45% Ni, 8-15% Cr, 0.3-0.5% C. 18/8 Cr-Ni austenitic steel is well known. (2) In cast irons Ni addition varies from 0.7 to 3%. When Si content of cast Fe is high, Cr is added together with Ni in the ratio Cr/Ni = 1/3. Ni can be introduced in cupola charges or in ladle metal. Effects of Ni are summarized as follows: (a) it breaks up cementite but not pearlite which is finer and harder with Ni additions, (b) it gives regularity in distribution of graphite in fine flakes, (c) it homogenizes hardness in different thicknesses of a same casting. Ni additions are also valuable in chilled cast Fe (Ni 4, Cr 1) and in austenitic, corrosion and heat resisting, cast irons (Ni 16, Cu 6, Cr 1.3). FR (27)

Effect of Small Percentages of Chromium on the Quality of Cast Iron. Charles O. Burgess. *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 492, Oct. 1932 13 pages. Small amounts of Cr were added to small charges of Fe in a crucible and test bars cast in sand. The iron contained 2.8% C and 2.2% Si. Another series of irons of the same analysis was prepared in a cupola by adding Cr to the ladle. Further data were obtained from 13 cupola heats of irons containing from 0.06 to 0.50% Cr; the C in these heats was between 3.60 and 3.92% and the Si between 2.00 and 2.50%. The addition of from 0.25 to 0.50% Cr produced a definite improvement in the strength, deflection and density. The uniformity of hardness for different sections was increased by Cr. The Brinell hardness was increased, but the irons could be readily machined. Growth tests indicated that small amounts of Cr increased the heat-resisting properties. The effect of Cr on the microstructure is shown. 10 references. JLG (27)

The Influence of High Silicon Content on Certain Properties of Castings. (Influence des teneurs élevées en silicium sur certaines propriétés des fontes.) Auguste Le Thomas. *Comptes Rendus,* Vol. 195, Oct. 17, 1932, pages 657-660. The property of interest here is essentially that of resistance to high temperatures. A table shows the properties of various castings with different amounts of Si. The effect of small contents of the latter on the temperature of graphitization is considerable. The superficial corrosion in air at high temperature is diminished with increasing Si content. OWE (27)

EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

The Variation with Temperature of the Thermoelectric Power of Nickel and Some Copper-Nickel Alloys. K. E. Grew. *Physical Review,* Vol. 41, Aug. 1932, pages 356-365. The thermoelectric power of pure Ni against Pt has been measured between 0° and 500° C.; similar measurements have been made on 2 Cu-Ni alloys containing respectively 94 and 79% Ni. A differential method was used in which the change in thermoelectric force corresponding to a small temperature change was observed. The results are discussed in relation to Stoner's theory. Although the experimental results have the same general characteristics as those calculated, factors not considered in the simple theory are involved, even at temperatures at which the assumption that the magnetization is due to spin moments only is approximately valid. WAT (29)

Metals at High Temperatures (Les Métaux aux températures élevées). J. Galibourg. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 134-142. The author doubts the existence of a true creep limit. The resistance of a metal to deformation at elevated temperature has to be defined by the parameters of the flow-time curves. Short-time test methods are used by the author, determining the first perceptible flow with a Martens extensometer. Details are not given. Some curves are shown but the composition and heat-treatment of the 4 steels tested are not stated. 5 references. HWG (29)

Modulus of Elasticity of Steel at High Temperatures. (Der Elastizitätsmodul von Stahl bei hohen Temperaturen.) E. Honegger. *B B C Nachrichten,* Vol. 19, July/Aug. 1932, pages 61-64. A brief survey is first given on the few investigations so far carried out on the elastic behavior of steels at elevated temperatures. The dynamic and the static modulus of elasticity were determined on 4 steels, a medium straight C steel, a 5% Ni steel, a Cr-Ni and a Cr stainless steel. The test bars, supported at both ends, were subjected to oscillations in the middle by an electromagnet fed with a.c. of variable frequency. From the natural frequency numbers thus determined the dynamic modulus of elasticity was calculated. The static modulus of elasticity was determined in tensile tests in regular testing time as well as slowed-down testing time (3 times that of the regular time). For the first 3 steels the dynamic modulus at room temperature is always somewhat lower than the static modulus of elasticity. This is probably due to the variety of testing methods and other factors. The plotted curves show steady but relatively slow decrease of the dynamic modulus with increasing temperature. The difference between the 3 steels is not considerable; at 600° C. the modulus is still about 70% of that at room temperature. This is remarkable on account of the fact that at this temperature the creep limit is already very low, if not zero. The dynamic modulus of elasticity of the Cr stainless steel shows a course similar to the other steels. At 300° C. the values of dynamic, normal static and slow static modulus of elasticity are still close together, at 600° C., however, the slow static modulus decreased much more than the others. The following figures were found at 600° C.: 670,000 kg./cm.^{2} for the slow static, 1,000,000 kg./cm.^{2} for the normal static and 1,460,000 kg./cm.^{2} for the dynamic modulus of elasticity, i.e. the modulus is the smaller the larger the time of load application. The dependence of the modulus on the time necessitates taking account of the temporal course of the load in calculations. The shear modulus seems to behave similarly. (See S. Timoshenko & F. L. Everett, Strength of materials subjected to shear at high temperature, Thesis, University of Michigan, Ann Arbor, 1931.) Tests on the shear modulus by the author are in progress. GN (29)

High Steam Temperatures, Some Experiences and Considerations. (Hohe Dampftemperaturen, einige Erfahrungen und Betrachtungen.) F. Marguerre. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Mar. 19, 1932, pages 287-292. The author relates some experiences in the power station of Mannheim where, for several years, steam of 470° C. has been generated. The greater temperature differences at heating up, and creep phenomena require a different construction of superheaters and flange connections than at lower temperatures. The stresses must be essentially reduced. A formula is developed by which it can be determined after which time the joints in a superheater will become leaky on account of creeping. All his considerations lead to the conclusion that medium pressure and high temperatures in order to equal the thermal efficiency of the highest temperatures do not offer any advantages in the investment cost, and the constructive difficulties become disproportionately great; the better way to a high heat economy at the present time is to use high pressure and to increase the temperature in superheaters. Ha (29)

Growth of Cast Iron at High Temperatures. (Wachsen von Gusseisen bei erhöhten Temperaturen.) G. Calbiani. *Maschinenbau,* Vol. 11, Mar. 3, 1932, page 103. Paper read before the International Congress, Milan, Sept. 1931. See "Permanent Growth of Gray Iron on Heating," *Metals & Alloys,* Vol. 3, June 1932, page MA 189. RFV (29)

Mechanical Properties of Metals at High Temperatures. (Les Caractéristiques Mécaniques des Métaux à Chaud.) J. Galibourg. *Science et Industrie,* Vol. 15, Oct. 1931, pages 455-462. Gives a summary of important work on the following types of high-temperature test: hardness, shock, torsion, bending, fatigue and friction. The author then considers tensile testing (1) by shock, (2) under the conditions of the normal test at room temperature, (3) under constant load. Experimental methods for the latter are described, and observed effects are summarized. The question of limiting loads is discussed and an attempt is made to coordinate the results obtained by various groups of workers. 17 references. FR (29)

Materials at High Temperatures. R. G. Batson & H. J. Tapsell. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 160-167. Historical discussion of English work on creep. General comments on the problem with typical curves. Long time tests are advocated since failure by intercrystalline cracking is not shown up by short time tests. They should be carried down to a creep rate of not over 10^{-5} per day (sometimes 10^{-8}) and should last at least 40 days. Endurance under repeated stress at high temperatures is briefly discussed. In general, failure occurs due to yielding by creep rather than by a primary fatigue failure at high temperatures. 9 references. HWG (29)

Second Report on Comparative High-Temperature Tension Tests of Metals at Different Laboratories. C. L. Clark, R. Sergeson & H. C. Cross. *Proceedings American Society for Testing Materials,* Vol. 30, 1930, Part I, pages 96-109. A few tests and test methods for tensile tests of high Cr-steels are described and recommendations made for the placing of the coils on the samples for heating them electrically. Thermocouples are preferred for the temperature measurements, and temperature variations in samples should be carefully noted. Ha (29)

Influence of Recrystallization Temperature and Grain Size on the Creep Characteristics of Non-Ferrous Alloys. C. L. Clark & A. E. White. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 492-516. Long time creep tests were conducted on 70:30, 60:40, 85:15 brasses, Admiralty metal, and Tobin bronze at temperatures both below and above their lowest recrystallization temperatures. At temperatures below their lowest recrystallization temperature, the alloys tested were capable of withstanding stresses of appreciable magnitude without measurable continuous creep while at temperatures above, appreciable continuous creep occurs under the stresses used with a probability that continuous creep would occur at any stress. At temperatures below the lowest recrystallization temperature, fine-grained materials offer the greater creep resistance, while at temperatures above, the coarse-grained material is superior. VVK (29)

Flow of Steels at Elevated Temperatures. F. P. Coffin & T. H. Swisher. *Transactions American Society of Mechanical Engineers,* Vol. 54, June 15, 1932, Applied Mechanics, pages 59-68. Flow tests of steel were made with the object of predicting the ability of materials to maintain dimensions under stress at elevated temperatures for long periods of time, that is, for 5, 10 or 20 years. 3 different test methods were used: (1) The rate of flow is measured for a series of successively reduced stresses at each of several successively increased temperatures; this permits obtaining a mass of information in the shortest possible time. (2) New specimens were subjected to constant stress at a constant temperature; these tests furnished more fundamental information regarding the nature of flow. (3) A constant-extension test was made where the stress is varied with time to maintain a constant total elongation, that is, elastic plus plastic elongation. The tests with different materials are described in detail and from families of curves predictions are attempted as to the flow in the course of, for instance, 100,000 hours. As this requires an extrapolation of more than 20:1 very judicious use should be made of the conclusions and due consideration given to the accompanying metallurgical factors. If a long-time test of a steel shows a very small flow rate which decreases as time goes on it can be safely inferred that the extension time curve will not suffer inflection. Ha (29)

The Endurance Limit of a 0.33 Per Cent. Carbon Steel at Elevated Temperatures. J. W. Cuthbertson. *Iron & Steel Institute, Advance Copy* No. 3, Sept. 1932, 16 pages. Endurance tests were made by a modified form of Gough's load-deflection method in which the load was increased continually and the deflection measured with an accuracy of 0.00005" by means of a recording apparatus. Determinations of endurance by standard long-time methods indicated that the accelerated tests gave the true endurance limits. Tests were made at temperatures up to 350° C. on a 0.33% C steel as received from the mill. A pronounced minimum was found in the fatigue-temperature curve at 123° C. and a maximum at 200° C. It is pointed out that discontinuities have been observed in other properties at the lower temperature. At the higher temperatures some of the steels were tested in N. Below 200° C. the same values were obtained as for specimens tested in air, but at higher temperatures those tested in air had the lower endurance limits due to oxidation of the surface. Creep was observed in nearly all of the specimens tested at the higher temperatures, and made the determination of the endurance limit difficult. 15 references. JLG (29)

Strength of Metals at High Temperatures. *Engineer,* Vol. 154, July 1, 1932, page 18. Short summary of a memorandum issued by the Department of Scientific & Industrial Research entitled "The Strength at High Temperatures of Six Steels and Three Non-Ferrous Metals." See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 334. LFM (29)

Metals for High Temperatures. (Metalle für hohe Temperaturen.) *Kali, Erz und Kohle,* Vol. 29, Aug. 10, 1932, pages 129-130. Survey on the present status in this field with special reference to recent American advancements. GN (29)

Use of Metals at Elevated Temperatures. Clyde E. Williams. *Brick & Clay Record,* Vol. 80, Apr. 1932, pages 195-197. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 192. Ha (29)

Discussion on High Temperature Properties of Metals. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 168-177. The National Physical Laboratory representatives stated that short time tests were unreliable and in the case of materials subject to intercrystalline cracking, definitely misleading. Van Nieuwenburg (Delft) reported that Cu is somewhat volatile in super critical steam at 300-350 atm. and 400-425° C., Ag slightly, Ni not at all, and that boiler plate with 0.2% Si is desiliconized in 10 days. Pomp gave creep curves on a 0.22% C and a 0.18% C, 1.56% Ni steel for 500-600 hours for comparison with his "accelerated" method. They are plotted to too small a scale to show whether creep was still occurring and the observed points are not shown. Gough offered to make real, long time creep tests on material to be submitted by Pomp that had been given the "accelerated" test. Gough pointed out that in either long or short time tests great attention must be paid to temperature control. Rosenhain thought that a short time test might be of some value to see if a sample submitted was typical of the class of material it was supposed to represent, but that for design figures long duration tests are necessary. HWG (29)

The Action of Elevated Temperatures on Cast Irons. (L'action des temperatures elevees sur les fontes.) Auguste Le Thomas & Renee Le Romancer. *La Fonte,* Jan. 1932, pages 76-95. Thermal expansion diagrams are shown for ordinary and heat resistant cast irons up to 800° C. A number of conditions are outlined which help to render cast irons more heat resistant, these are: keeping the Si content low, this is important; keeping the C content low, not as important as Si; keeping up the Mn content, this element exerts only a moderate influence; and by additions of special elements as Cr alone, Cr and Ni in combination, and Cr, Ni and Cu in combination. 6 heat resistant cast irons are recommended. Chemical compositions in % are:

	C	Si	Mn	S	P	Cr	Ni	Cu
					Less than			
(1)	2.6-3.3	0.6-1.2	0.3-0.5	.08-.12	0.6			
(2)	same as	above				0.3-1.0		
(3)	2.8-3	0.8-1.3	0.5-0.8	.05-.09	0.3			
(4)	3. -3.4	1.3-1.6	.7-1	.05-.09	0.3	0.4-0.8		
(5)	2.8-3.2	1.2-1.4	.8-1	.05-.09	0.3	0.5-0.8	1.5	
(6)	2.5-3	1.5	0.5	0.05	0.3	1.5-2	13	6

WAT (29)

An Accelerated Test for the Determination of the Limiting Creep Stress of Metals. W. Barr & W. E. Bardgett. *Engineering,* Vol. 133, Mar. 4, 1932, pages 293-294; *Iron & Coal Trades Review,* Vol. 124, Feb. 26, 1932, pages 354-355; U. S. Patent 1,888,755, Nov. 22, 1932. The test depends on the measurement of the diminishing rate of creep in a stressed test piece by means of a steel weigh-bar, so that the creep of the test piece is accompanied by a proportionate decrease in the applied stress. The extension of the weigh-bar is measured by means of an extensometer consisting of an Ames dial gage in conjunction with a simple lever system. One division of the dial is equal to a stress of 0.006 ton approximately, and since readings can be made to ¼ of a dial division this is equivalent to 0.0015 ton approximately. The extension of the test piece corresponding to this value of stress decreases 7 x 10^{-6} in./in. approximately. The stress is applied to the test piece by means of a screw, and the actual stress on the test bar is known from the extension of the weigh-bar. Should any creep take place in the test piece, this is immediately indicated by a decrease in stress as shown by the extensometer. If a test piece is stressed to a given load and at a given temperature well within the creep range, the test piece creeps fairly rapidly at first and there is a corresponding rapid decrease in stress. As the stress decreases the rate of creep decreases. If a new test piece is stressed at the same temperature to a remanent stress of the preceding test, it shows an initial rapid decrease in stress which, however, takes place at a lesser rate than the initial stress decrease in the preceding test. It was shown that the initial stress was approximately proportional to the decrease in stress in a given time (48 hrs. gave the best combination of accuracy and limited test duration). By plotting the decrease in stress against the initial stress, a straight line drawn through the points if produced cuts the initial stress axis at a certain value, representing the stress which will give no measurable decrease in stress in the period of test. This must correspond to a total creep of less than 7 x 10^{-6} in./in. for the period of test. Limiting creep stresses are given for C steels, C-Mo, Cr-Mo, Ni-Mo, Si-Mo, Ni-Va, Mn, stainless Fe and austenitic stainless between 400° and 600° C. WAT (29)

The Flow of Solid Metal Aggregates. C. H. M. JENKINS. *Journal of Rheology*, Vol. 3, July 1932, pages 289-297. The paper discusses the extent and nature of the internal changes in a metal subjected at a suitable temperature under a steady stress sufficiently high to produce flow and rupture. Under load, movement in metals is possible by one of three not necessarily independent means: slip on the cleavage planes, general movement in the grain boundary material and continuous recrystallization of the strained material. In the first stage of creep testing a rapid extension of the specimen occurs which decreases in rate as the second stage is approached. In the second stage the extension is fairly constant, while in the third stage the specimen elongates at an increasingly rapid rate until rupture occurs. Since short time creep tests refer only to the initial stage of testing while the true resistance to prolonged loading is based on the resistance to flow in the second stage the interpretation of creep properties of material by these means is difficult. The strength and behavior of any metal under stress is dependent on its previous history. Cast alloys are different in structure and larger in grain size from rolled material which probably accounts for their superiority in strength over wrought materials at high temperatures. The mode of fracture indicates that the temperature at which the practical strength value of a material is rapidly reduced by creep is in the same range as the temperature of recrystallization of similar material in the cold-worked state. The action of grain boundary and crystalline material within the grains are discussed in relation to intercrystalline rupture and slip. CHL (29)

Strength of Cast Steel at High Temperatures. K. H. MÜLLER & E. PIWOWARSKY. *Foundry Trade Journal*, Vol. 46, May 19, 1932, page 307; *Iron & Coal Trades Review*, Vol. 124, May 6, 1932, page 768. See "High Temperature Strength of Alloy and Plain Carbon Cast Steel," *Metals & Alloys*. Vol. 3, Nov. 1932, page MA 334. OWE+Ha (29)

The Properties of Copper in Relation to Low Stresses. The Effect of Cold-Work, Heat-Treatment, and Composition. Part II.—Creep Tests at 300° C. and 350° C. of Arsenical Copper and Silver-Arsenical Copper. H. J. TAPSELL & A. E. JOHNSON. *Journal Institute of Metals*, Vol. 48, 1932, pages 89-94. See *Metals & Alloys*. Vol. 3, Oct. 1932, page MA 314. (29)

Accelerated Method for the Determination of the Creep Limit of Steel. (Abkürzungsverfahren zur Bestimmung der Dauerstandfestigkeit des Stahles.) A. POMP & W. ENDERS. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 143-159. As an approximation toward an indication of creep resistance, the rate of flow from the 5th to the 10th hour of a test is taken instead of in a still earlier period as formerly suggested by Pomp and Dahmen. The authors assume that a flow rate of 0.003% per hour in the 5 hour period mentioned corresponds to a stress that has some meaning as a creep limit. Discussion developed serious objections and marked opposition to this assumption. A salt bath is used to maintain constant temperature of the creep specimen in the 48 hour tests. It is claimed that an accuracy of ± ¼, ± ½, ± 1, ± 1½° C. is obtained at 300°, 400°, 500° and 600° C. respectively, but it is stated that room temperature is regulated to 3° C. Room temperature changes will affect the results, since a Martens type extensometer with legs protruding, is used, which multiplies the actual extension by 1000. Photographic registration of extension may be used. Long time tests of 700 to 1400 hours and one of 2400 hours were made at single loads on 2 steels at 400° and 500° C. but are plotted on so small a scale that it is difficult to tell how nearly creep had ceased. Aging of the steel is suggested as a possible cause for diminution of creep. HWG (29)

Apparatus for Determination of Creep Rates and Creep Resistance. (Apparat zur Bestimmung von Kriechgeschwindigkeit und Kriechfestigkeit.) W. ROHN. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 183-186. A specimen 10 mm. diameter x 1.3 m. long is suspended in an electric furnace so that 1 m. is uniformly heated, and is loaded by dead weights. The furnace is surrounded by an Invar frame carrying a contact point. A knife edge clamped on the lower end of the specimen bears on a spring carrying another contact point. If the specimen creeps, it depresses the spring and opens the contact, cutting out some of the current passing through the furnace, the furnace and specimen then cool till the specimen contracts enough to close the circuit again. If further stretching occurs, the temperature again falls till there is no more stretch. Hence, the specimen itself finally selects a temperature at which it will withstand the applied load without stretching. When the temperature becomes constant for a long period the creep limit has been reached. In 5000 hr. test temperature sank for 1500 hours and then remained constant. HWG (29)

The Creep of Metallic Materials at Elevated Temperatures and the Influence of Heat-treatment. (Die Kriechfestigkeit metallischer Werkstoffe bei erhöhten Temperaturen und ihre willkürliche Beeinflussung durch Warmevorbehandlung.) W. ROHN. *Zeitschrift für Metallkunde*, Vol. 24, June 1932, pages 127-131. The creep of the following alloys was studied: 15% Cr, 7% Mo, 16% Fe, 60% Ni, 2% Mn; 15% Cr, 7% Mo, 15% Fe, 63% Ni; pure Ni; pure Fe; and a series of structural alloys. The methods used to measure creep are discussed, and a *new method for measuring creep* is described and applied to the alloys listed. Instead of the conventional mirror for reading change in length at a given temperature the new method operates on the following principle: the test piece within the furnace operates as a thermo-regulator for the heating current holding the furnace temperature at a given value so long as no creep obtains; when the piece creeps the temperature of the furnace falls off gradually to a temperature at which creep ceases; this temperature is recorded automatically; the temperature of cessation of creep and the load applied to the piece thus give the creep limit. Creep curves obtained in this way are reproduced in a series of diagrams which also show the effect of previous heat-treatment; this effect is appreciable. RFM (29)

Behavior of Metallic Materials at High Temperatures. (Das Verhalten metallischer Werkstoffe bei Temperaturen bei denen auch nach kleiner Verformung Rekristallisation eintritt). W. ROHN. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 177-182. Many applications of metals for heat-resisting purposes, and most experimental studies of creep relate to temperatures below 600° C. Rohn discusses the higher temperature region, using as his chief example an alloy of 15 Cr, 63 Ni, 15 Fe, 7 Mo, which he finds, if first annealed at 1250° C., will stand a load of 700 lbs./in.^{2} at 840° C., 250 lbs./in.^{2} at 1100° C. and 140 lbs./in.^{2} at 1200° C. on the basis of long time tests by methods described in the article that follows. He is strongly opposed to the use of accelerated tests as a substitute for long time creep tests. Approaching the final temperature of a test from above gives lower final creep values than approaching it from below up to about 850° C., but at higher temperatures the same value is reached on this special alloy. HWG (29)

Strength of Light Metals at High Temperatures under Static and Repeated Loadings. (Untersuchungen über die Warmfestigkeit von Leichtmetallen bei statischer und bei wechselnder Beanspruchung.) W. SCHWINNING & E. STROBEL. *Zeitschrift für Metallkunde*, Vol. 24, June 1932, pages 132-137; July 1932, pages 151-153. The following materials were studied: Al (99.5%), cold-drawn and annealed, and the alloy Lautal. Diagrams are given for: (1) stress-strain curves of cold-drawn Al up to 0.4% elongation at 20°, 150°, 250° C., showing total elongation, elongation after removal of load, and (by subtraction) elastic elongation; (2) ordinary stress-strain curves for cold-drawn Al up to 0.4% elongation at 20°, 50°, 100°, 150°, 200°, 250°, 300° C.; (3) similar [to (2)] curves for Lautal; (4) curves of yield point (0.01%, 0.05%, 0.2%), ultimate tensile strength, elongation, and reduction in area between 20° and 300° C. Endurance curves over a similar temperature range are given, and the endurance and static strength values compared. The microstructures of samples tested are described and illustrated. The influence of annealing temperature upon the fatigue strength of Lautal is illustrated by a diagram. The fatigue behavior of Lautal and duralumin are compared. RFM (29)

REDUCTION METALLURGY (31)

A New Method for the Valuation of Ores. (Ein neues Verfahren der Erzbewertung.) J. KLÄRDING. *Internationale Bergwirtschaft und Bergtechnik*, Vol. 25, Aug. 15, 1932, pages 105-106. Investigations of Wüst and Rutten (*Mitteilungen Kaiser Wilhelm Institut für Eisenforschung*, Vol. 5, 1924, pages 1-12) on physical characteristics of Fe ores and of the author (*Metals & Alloys*, Vol. 2, Dec. 1931, page 327) show the importance of a chemical valuation of Fe ores. GN (31)

Contributions on the Valuation of Iron Ores. (Beiträge zur Bewertung von Eisenerz.) HANS POETTER. Doctor's thesis, Technische Hochschule Breslau, July 1932, 124 pages. In view of the fact that a proper valuation of the metallurgical properties of Fe ores particularly has to take into consideration its reducibility, a testing method was developed which simulates the reduction in the blast furnace. The reduction of 4 typical Fe ores (limonite, minette, hematite, kidney ore) was studied in laboratory tests, with special reference to the effect of the grain size on the reduction. A new optical method for determining the porosity in volume %, the pore coefficient, the pore content and the pore surface was devised. The experimentally determined amount of reduction of the 4 ores plotted against the grain size gives a curve that is similar for all 4 of the ores, thus indicating the close relation between reductibility and grain size. The shape of the curves is determined by the pore surface/cc. ore. It was found that all of the ores show a maximum of indirect reduction at a certain small grain size. The maximum is practically the same for the 4 ores. The effect of grain size on the reduction of an ore can be determined by the optical method developed without making reduction experiments. The advantages resulting from a systematic crushing of the ores reduced in blast furnaces are discussed. The results of the experiments led to the proposal of a practical valuation of Fe ores in which the grain size is the prime factor and the coke consumption can be pre-determined. 49 references. GN (31)

Blast-Furnace Engineering. W. R. BROWN. *Iron & Steel Industry & British Foundryman*, Vol. 5, May 1932, pages 301-305; *Engineer*, Vol. 153, May 13, 1932, pages 520-522; *Engineering*, Vol. 133, May 6, 1932, pages 557-559; May 13, 1932, page 578. Includes discussion. Paper read before the Iron & Steel Institute, May 1932. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 359. CHL+LFM (31)

Rebuild Portsmouth Blast Furnace. *Blast Furnace & Steel Plant*, Vol. 20, July 1932, pages 581-587. In reconstructing its Portsmouth, Ohio, blast-furnace, Wheeling Steel Corp. installed a new cast-Fe H_2O-cooled hearth jacket, new tuyere jacket; new bosh bands; top with modern uptakes, downcomers, air-cooled bleeding-valves, and new cone ring; new lining; new gas cleaning equipment; sludge recovery systems; zoned hot-blast stove linings; electric mud gun; air mixing equipment; and selective stock revolving distributor. Heating surface of each reconstructed stove is 206,152 ft.^{2} MS (31)

Blast Furnace Practice. R. A. HACKING. *Proceedings Staffordshire Iron & Steel Institute*, Vol. 46, Session 1930-31, pages 86-113. Includes discussion and 21 references. A general review of blast furnace practice including thermochemical principles involved. GTM (31)

Charging Coke at the Blast Furnace. *Rolling Mill Journal*, Vol. 7, Nov. 1, 1932, pages 55-57. Tables and calculations show possible error in amount of C charged into a blast furnace, where coke is weighed in a scale car in the stockhouse, rather than gaged by volume in skip bucket, and where there is a variation in size of coke. In the example given, error amounts to 3.3%. Error is due to the fact that small coke is heavy, because of its higher ash and moisture contents, and its C content is low. Gaging by volume in skip bucket corrects this error, insofar as it compensates for small coke by filling up skips and increasing C value of unit charged. MS (31)

The Softening of Iron Ores in the Blast Furnace. (Die Erweichung der Eisenerze im Hochofen.) A. WAGNER. *Stahl und Eisen*, Vol. 52, Aug. 4, 1932, page 764. Summary of paper by Jindrich Sárek published in *Hornicky Vestnik*, Vol. 14, 1932, pages 130-134. The gas ratios in the blast furnace are dependent on the behavior of the ore after softening. Experiments were made in order to obtain an approximate idea of the temperatures at which certain ores are converted in the blast furnace into the plastic state, and in what measure gases are permeable through the softened ores. Prisms, 95 x 41 x 41 mm., were constructed of different ores and these prisms were heated in an electric furnace in an atmosphere of blast furnace gas until they began to soften. The softening temperatures of 3 Bohemian ores were 1050°, 1080° and 1160° C. A Morrocan ore softened at 1180° C., a Swedish ore at 1170° C. and another ore at 1200° C. The Bohemian ores showed decreases in volume up to 43%, while the other ores underwent no appreciable change in volume. Sárek concluded from his tests that it is advantageous to mix ores with very high and very low gas permeabilities, since such mixtures are equivalent to ores of average gas permeability in the plastic zone. The major difference of the softening range, for cold as compared with hot furnace passage, is greater for ores which soften at low temperatures, and conversely, less for ores which have high softening points. DTR (31)

Reduction of Metals With Gas. G. V. RUYKOV. *Tzvetnuie Metallui*, Nov. 1931, pages 1442-1454. A new method of extracting metal from oxidized Zn-Pb ores, Zn bearing slags and other materials, by reduction with gas is described. The charge, consisting of powdered slag, coal and fluxes, is blown into a preheated furnace. CO may be used also. In passing through the reducing zone, the charge is reduced, the metals vaporized and oxidized by the excess air, and then discharged from the furnace as oxides; the metallic oxides are caught in dust collectors. Difficultly oxidizable metals, such as Cu and Ni melt and accumulate on the bottom of the furnace from which they can be tapped. Experiments were made on Zn-Pb ore, Zn- and bronze-bearing slags, Zn concentrates and Pb ores using powdered coal as the reducing material. Sn and Sb are partly oxidized, partly go to the melt. The slag may be utilized for construction purposes, 95% of the Zn, 96% of the Pb, 85% of the Sn, and 95% of the Cu were recovered. A 100% recovery of Sn and Cu is thought to be possible. By the use of CO it was possible to extract Zn from various Zn-bearing materials, such as slags, retorts, polymetallic sulphide ores and concentrates. The product was purer than in the ordinary smelting, and contained no Fe or slag. Experiments on a commercial scale are now under way and results will be reported later. BND (31)

A Method of Recovering Metals from Cu-Zn Ores. S. CH. TONAKANOV. *Tzvetnuie Metallui*, Nov. 1931, pages 1455-1470. Laboratory and semi-commercial experiments on Zangezur Cu-Zn ores led to the following conclusions: Economical metallurgical treatment without preliminary concentration of these ores is possible. The ore is roasted at 850°-900° C. until S is brought down to 7-9%. The ore is ground to 30 mesh. 100% excess of the reducer (powdered coal) is used, which for the ores containing 19.5% Zn is equivalent to 8% of coke by weight. The temperature in the reducing furnace should be 1200°-1400° C. The atmosphere should be strongly reducing, the amount of CO in the discharged gas should be 5-7%. The matte contains 45-50% Cu; slag and ZnO. The ZnO is caught in bag houses or Cottrell precipitators. 95% reduction of Zn and Cu was obtained; noble metals were recovered completely. BND (31)

Preparation of Ferrous Sulphide from Ferric Oxide and Sulphur Dioxide. G. A. SHAKHOV, SH. MARGOLINA & G. I. GLADKOV. *Tzvetnuie Metallui*, July 1931, pages 866-871. The methods of synthetic preparation of FeS for use in Cu smelters where natural pyrite is not available were investigated. SO_2 from converters is passed through a mixture of charcoal or CO, and iron ore (Fe_2O_3) at high temperatures. About 8% of charcoal or coal in the charge is sufficient for the reduction; better results were obtained by using coal, and at higher temperatures (900°). With CO the yield was much lower but the percentage utilization of SO_2 was higher. BND (31)

Researches on Gold, Silver and Copper in Blast Furnace Slag. K. KUBOTA. *Journal Mining Institute of Japan,* Vol. 48, No. 565, 1932, pages 475-513.
The forms of Au, Ag and Cu in blast furnace slag were investigated by microscopic examination, chemical analysis, oil flotation and treatment in an electric furnace. Although the compositions of sulphides suspended in the slag varies widely, the greater part is the same as the matte. The total amount of sulphide calculated from the results of the microscopic examination was somewhat smaller than that from chemical analysis, perhaps due to neglecting more minute particles. Chemical analyses showed that the Cu was distributed as follows: 40 to 60% in the prills of matte and 20 to 50% in more minute particles (less than 0.0003 mm. diameter). The Cu in the oxidized form was usually less than 10%, unless too great a proportion of roasted ore had been charged. The Cu sulphide was estimated by dissolving in $AgNO_3$ solution, the oxidized copper by H_2SO_3 solution and the most minute particles of sulphide by treating the residue again with $AgNO_3$. The Cu content of the sulphide recovered by oil flotation amounted to 30 to 50% of the total Cu in the slag, which was consistent with the results of other tests. Very small particles of raw ore were found to be entangled in the slag especially in the case of the reverberatory furnace, in which the smelting time is shorter. The treatment in an electric furnace having C electrodes is most efficient for recovering the precious metals contained in the raw ores, the process being as follows: small suspended particles of sulphides coalesce by the action of low grade matte produced from Fe pyrite, and the Cu in the oxidized state is reduced to enter the matte. Fe sulphide is very fusible and as its specific gravity lies between those of matte and slag, it remains for a long time in contact with the sulphide particles affording more opportunities of absorbing precious metals. The matte produced from Fe pyrite has an advantage of being separated very easily from the slag. ½ of its S is liberated, causing boiling of the molten bath, which brings about effective agitation. The electric furnace has merits of its own and moreover the metallic Fe produced by the reducing action of the electrode C has a strong power of absorbing Au, Ag and Cu. The Cu and Fe_2O_3 are reduced thereby and prevent gas flotation occurring. By using the electric furnace, Cu losses were reduced ½. A number of photomicrographs are shown. YO (31)

The Efficiency of Blast Furnaces Working with Coke Having a Reduced Sulphur Content. A. GOTLIEB. *Domez,* No. 4-5, 1932, pages 69-73. Using the formula developed by the author in a former paper (*Domez,* No. 6, 1930), the influence of S content of coke on the cost of finished Fe is calculated. Under Russian conditions and assuming the cost per ton of cast Fe as 49.50 rubles, the reduction of S in coke from 3.2% to 2.2% means a saving of 7.40 rubles; from 2.2% to 1.6%, 3.40 rubles; and from 1.6% to 0.8%, 1.50 rubles/ton of Fe. No S limits in the finished Fe are given. (31)

Dry Blast for Pig Iron Production. J. B. FORTUNE. *Iron & Steel Industry & British Foundryman,* Vol. 5, Apr. 1932, pages 255-259, 268; May 1932, pages 287-292. The weight of air put into a blast furnace considerably exceeds that of the solid materials, involving a large and variable quantity of water vapor which, apart from other disadvantages, results in irregular working and wastage of sensible heat. Tests on a British blast-furnace showed that with an increase in average atmospheric moisture of from 3 to 5 grains/ft.^{3} there was an increase of 140 lbs. of coke consumed/ton of pig Fe. Results show a disadvantage in drying the blast beyond a moisture content of 1.25 grains/ft.^{3}, while 1.5 grains/ft.^{3} is probably the optimum degree of dryness. 4 systems of drying are adaptable to blast furnace conditions. 2 employing silica gel are briefly described. The Carrier system and the $CaCl_2$ dehydration method are described more fully. CHL (31)

Air Drying for Blast Furnaces. (Dessication du Vent des Hauts Forneaux.) JEAN MUSELLE. *Revue Universelle des Mines,* Series 8, Vol. 8, Aug. 1, 1932, pages 69-73; Aug. 15, 1932, pages 105-112. Production and quality of Fe is improved by dry air; drying can be effected by cooling, as in the processes of Gayley, Steinbart, Cattaneo and Schlessinger, or by dehydrating agents, $CaCl_2$ silica gel and concentrated H_2SO_4, as done by Fryer, Cremer, Daubiné and Roy. These processes are investigated theoretically with regard to their efficiency and economical application. The conclusion is drawn that none of the processes is of any practical advantage as confirmed in practice by the abandonment of most of the methods. Ha (31)

Production Increase by Change in Air Blast Heating System. (Leistungsteigerung von Winderhitzern mit geringen Mitteln.) SIEGFRIED KREUZER. *Stahl und Eisen,* Vol. 52, July 28, 1932, pages 729-731. A blast furnace unit normally using a group of 3 hot blast stoves was operating under a reduced tonnage of 180 tons/24 hrs. An improvement resulted when 2 of the stoves of small heating surface were united into one heater and the system operated with a double heater arrangement, but the load characteristics and possibility of adjustment did not permit good safe operation with natural draft. Next, 2 stoves, total heating surface 5650 and 8200 in.^{2} respectively, were connected in a simple manner to one fan already in place, and good control of the air-heating unit was obtained. It was then possible to furnish necessary amounts of heated air for the temporarily reduced tonnage of 180 tons/24 hr. while saving on gas for the individual parts shut down. The gas requirements dropped roughly from 34 to 26% of the total gas produced and the gas loss from 14 to about 4%. The air temperatures became more uniform and many difficulties were eliminated by the shorter reversible periods and control of the furnace temperature. A further advantage for a 1-stove unit is that the furnace may be run after a shut-down period with the hot-air fan, instead of using the turbo-blower. DTR (31)

Blast Furnace Problems. The Re-Oxidation of the Crude Iron, and Its Ultimate Reduction. W. MCCONNACHIE. *Iron & Steel Industry & British Foundryman,* Vol. 5, Sept. 1932, pages 415-418. Crude Fe passing through combustion zones is oxidized and must be reduced again in space below tuyère zone. The ultimate reduction is effected very rapidly by transfer of O_2 from Fe to C. Author believes that the alkali metals, K and Na, are the active agents in the reduction of the FeO. The vapors of the alkaline oxides are reduced to the metallic state by the coke floating on slag surface making the metals available for further reduction of FeO. CHL (31)

Cheaper Nickel Steel from Sudbury Ores? *Iron and Steel of Canada,* Vol 15, July, 1932, pages 80-82. Some of the points that are not covered explicitly in the recent report by T. W. Hardy & H. H. Bleakney on "The Semi-Direct Production of Nickel Steel from Sudbury Ore" (Dept. of Mines, Ottawa) are illustrated. OWE (31)

Roasting of Concentrates Containing Quicksilver and Antimony and Their Separation by Successive Roasting. G. A. SHAKHOV & YA. SLOBODSKY. *Tsvetnuie Metallui,* Jan. 1932, pages 23-28. The separation of Sb and Hg from concentrates containing both metals is technically and economically possible. BND (31)

Equilibria in the System Bi-S-O. (Ueber Gleichgewichte beim System Bi-S-O.) R. SCHENCK & FR. SPECKMANN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, July 1932, pages 378-384. Reaction in roasting Bi-S-O ores takes place according to the formula $2Bi_2O_3 + Bi_2S_3 \rightleftarrows 6Bi + 3SO_2$. No equilibria with neutral or basic sulphates could be stated. The equilibrium diagram was investigated experimentally. It was found that S-free Bi metal can be obtained from Bi_2S_3 by roasting only if the conversion goes on with a large excess of oxide and at the same time the SO_2 is removed promptly by a good vacuum. A lack of oxide produces the eutectic material $Bi\text{-}Bi_2S_3$. Ha (31)

Some New Views on Smelting and Re-melting Processes. J. E. FLETCHER. *Proceedings Staffordshire Iron & Steel Institute,* Vol. 46, Session 1930-31, pages 42-85. Includes discussion. The process of making cold blast pig Fe is considered in detail, introducing a new view of the alloying action of Si, Mn, P, and S in the blast furnace hearth. The cold blast pig irons are all hypo-eutectic, and the hot blast pig iron are hyper-eutectic (higher than 4.3% C content). Based on this new view of alloying, pig Fe has 3 stages of formation: (1) The genesis of the eutectic constituent, (2) Alloying with Si, Mn, Fe, and P forming a second constituent, (3) Formation of the liquid pig Fe and the partial recarburization of the second alloyed constituent. GTM (31)

Recent and Future Iron Production Methods. (Neuere und zukünftige Eisengewinnungsmethoden.) H. PINSL. *Die Metallbörse,* Vol. 22, Apr. 16, 1932, pages 481-482; Apr. 23, 1932, pages 513-514. Evolution of Fe production methods is reviewed historically. The present trend toward eliminating the blast furnace, the drawbacks of which are pointed out, is considered with reference to the following most promising processes: (1) Edwin (Norsk-Staal) method (Norway); (2) Wiberg method (Sweden); (3) Method of the Bureau of Mines (U. S. A.); (4) Hornsey method (U. S. A.). The first 2 methods are based on the reduction of ore by gases while the American processes employ solid C. The Edwin process uses CO_2 and H_2 (80% and 10%, respectively) at 800°-850° C. so that the accompanying elements in the Fe ore are not reduced in the drum furnace. The resulting sponge Fe can be used directly in steel manufacture. Much attention is paid in this article to the difficulties of maintaining a proper working temperature, accomplished by a Schönherr arc furnace and a regenerator filled with coke. Entering the drum furnace at 900° C., the gases are used over again after successively passing a gas washer, water separator, filter and gas tank. The reduced furnace material goes to a magnetic separator which separates highly pure Fe, sponge Fe, intermediary products and tailings. The intermediary products go through the process again. The Wiberg method does not employ an arc furnace, but uses drum furnaces or, in case of suitable ores, stack furnaces. Furthermore only part of the gases remain in circulation and are regenerated in a charcoal regenerator. The rest is burnt or used for pre-roasting the charge. The Wiberg process preferably is used for high percentage magnetites. The American methods are described briefly. At Höganäs, Sweden, 10,000 tons of sponge Fe are produced annually at 112 Swedish Kronar per ton (1930) and advantageously used instead of scrap Fe. The fundamental factors which determine the economy of the sponge Fe process are pointed out. The author describes the latest tendencies in Germany to utilize domestic deposits low in Fe. The experiments of Diepschlag, I. G. Farbenindustrie, and Vereinigte Stahlwerke aiming at a volatization as chloride are stressed. The reduction of the chlorides in the solid and gaseous state (U. S. Patent) in the electric arc and by electrolysis is discussed. The difficulties of translating these laboratory tests into actual service conditions are considered critically. EF (31)

Progress in the Flash Roasting of Sulphide Ores. HORACE FREEMAN, *Transactions Canadian Institute of Mining & Metallurgy,* 1931, pages 263-273. See *Metals & Alloys,* Vol. 2, Sept. 1931, page 194. AHE (31)

Slags of Non-Ferrous Metals. (Über die Schlacken der Nichteisenmetalle.) E. J. KOHLMEYER. *Metallwirtschaft,* Vol. 11, Sept. 2, 1932, pages 485-489; Sept. 9, 1932, pages 499-504. A study of the systems $CaO\text{-}Al_2O_3\text{-}SiO_2$, $MgO\text{-}Al_2O_3\text{-}SiO_2$, $CaO\text{-}MgO\text{-}SiO_2$, $CaO\text{-}Al_2O_3\text{-}Fe_2O_3$, $MgO\text{-}CaO\text{-}Al_2O_3$, $CaO\text{-}Fe_2O_3\text{-}SiO_2$, $CaO\text{-}FeO\text{-}SiO_2$, $CaO\text{-}ZnO\text{-}Fe_2O_3$ and $ZnO\text{-}Fe_2O_3\text{-}SiO_2$, especially with respect to the solubility of oxides, the eutectic points and lines, temperature relations, fluidity and freezing points. 36 references. CEM (31)

Smelting in the Lead Blast Furnace, Handling Rich Charges. X. Preparation of the Charge. G. L. OLDRIGHT & VIRGIL MILLER. *United States Bureau of Mines, Report of Investigations* 3183, Aug. 1932, 50 pages. Quantitative data showing progressive physical and chemical changes when removing S by sintering on Dwight-Lloyd machines are given. S in the Pb blast furnace charge increases the loss of Pb in slag and diminishes the capacity of the furnace. Fairly complete removal of S by sintering, with the S in the charge as the major fuel, requires a roasting rate so that the temperature and SO_2 concentration of the gases made will cause PbO and not $PbSO_4$ to form. At the fast reaction rate and high temperature required, the fusible nature of Pb compounds decreases the surface exposed, which makes double sintering, with intermediate crushing of the first roasted charge, necessary. Double ignition on one machine is without value. As Pb in the sinter increases above 50%, difficulties on account of fusion increase. S in the final sinter cake is largely PbS. The temperatures and concentration of SO_2 evolved under the center of the cakes as the pallets traverse the windboxes on both sets of sintering machines are given. On the first pass after the cake is well ignited, temperatures were above 900° C. and SO_2 concentration was above 8% for about 7 feet of pallet travel. On the second roast, SO_2 concentration is usually above 16% between 1 and 5 feet of pallet travel, with temperatures about 900° C.; from thence both SO_2 concentration and temperature drop sharply. Data are given on the effect of the various variables on roasting and the S content of the final sinter. AHE (31)

The Waelz Process. WM. E. HARRIS. *Paper* read before 14th Annual Meeting of *American Zinc Institute,* St. Louis, Apr. 1932, 10 pages; *American Metal Market,* Vol. 39, Apr. 22, 1932, pages 5, 6. The Waelz process treats Zn ores, particularly low-grade ores and residues. The kilns vary in length from 52 to 140 ft. and from 4 to 10 ft. in diameter; their capacities from a few tons to several hundred tons per day. No preparation of the ores, such as drying, roasting or briquetting is required. The ore or residue, which need not be finely crushed, is mixed with the required quantity of coke or coal, usually 25 to 30%, and is fed into a slightly inclined horizontal rotary kiln. The physical, chemical or mineralogical condition of the raw material has little influence on the applicability of the process. The zone of volatilization occurs in the last 4/5 of the kiln. An oxidizing atmosphere is maintained above the charge, while inside the charge there are strong reducing conditions which free the Zn and Pb from the oxide or sulphide compounds. The escaping metallic vapors and the CO are burned above the feed. The process goes on independently of a heating flame and is maintained principally by the pre-added solid fuel in the main zone of reaction. The advantage of the method is that the reducing action is active for a comparatively long time and reduction and volatilization of the metals is more complete as an endothermic process the higher the temperature and the longer the reaction lasts. Of particular value is the process in the reduction of Zn-Cu-Pb ores in very finely disseminated state as here Zn and Pb are volatilized and Cu and precious metals remain as a matte which can be passed directly to the smelter. DTR + Ha (31)

Progress in the Natural Gas Reduction of Zinc. H. A. DOERNER, C. G. MAIER & R. S. DEAN. *Paper* presented at 14th Annual Meeting of *American Zinc Institute,* St. Louis, Apr. 1932. 8 pages. Experiments by the Bureau of Mines have proved the possibility of reduction of Zn ores by natural gas having a high content of CH_4. Modern steel alloys can be used in the equipment as they withstand the action of Zn vapors at 1000° C. satisfactorily. Flanged joints should be avoided. Temperatures at 1000° to 1500° C. are required to obtain good production rates, but at this temperature secondary ZnO formation becomes troublesome. Gas utilizations over 75% and extractions above 90% are possible on a large scale operation. The economic advantages of natural gas reduction are real but depend on the solution of the secondary ZnO formation which becomes excessively high at high production rates and high temperatures. It was found, however, that by using a catalyst which can be Al_2O_3 impregnated with Ni, Co or Fe, or even the Zn calcine itself, CO_2 and H_2O could be reduced readily. The question of proper design of the apparatus for sufficient and thorough mixing with the natural gas are discussed as on it depends the economical value of this process. Ha (31)

NON-METALLIC COATINGS FOR METALS & ALLOYS (32)

On the Passifying Effect of Lead Pigments. (Über die passivierende Wirkung von Bleipigmenten.) M. RAGG & A. RIEDEMANN, *Farben Zeitung*, Vol. 37, May 7, 1932, pages 1122-1124; May 14, 1932, pages 1154-1156. The principles accounting for the passifying effect of red lead are given in the introduction and tests are reported on electrolytic Fe coated with various commercial kinds of red lead. The potential measurements and determinations of losses in weight confirm the experimental results on the electro-chemical effect of red lead previously published by Maas & Liebreich (*Korrosion und Metallschutz*, Vol. 5, Jan. 1929, pages 1-7.) Not only the various kinds of red lead but also the other pigments tested shift the potential of the Fe surface in a $N/1$ KCl solution to base values whether the pigments are applied dry or moist. The phenomenon of the rust protection effect of red lead cannot be unequivocally explained on the basis of the testing results. Probably the lead soap formation plays the most important role, while with reference to gray lead minium the ability of (1) forming coherent coatings and (2) chemically binding humidity predominate. In contrast to the effectively rust-protecting layers of gray lead minium and lead chromate, the coatings formed by superoxides PbO_2 and MnO_2 are full of cracks and are porous and cannot prevent Fe from rusting. Potential differences between Fe and soft lead on one hand and between hard lead and type metal on the other, are practically the same whether the electrodes consist of pure lead or of lead alloys with 10% Sb and 2% Sn. EF (32)

The Effect of the Base Material on the Behavior of Coatings. (Der Einfluss des Untergrundes auf das Verhalten der Anstriche.) E. K. O. SCHMIDT. *Paper Second Corrosion Congress, Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Deutsche Gesellschaft für Metallkunde and Verein deutscher Chemiker*, Oct. 17, 1932, Berlin. Mimeographed report, page 2. The influence of chemical composition and physical properties of the base material on the adherence and the behavior of coatings was discussed on numerous examples of the lumber trade, light metal and iron industry. The favorable effect of even slight improvements of the corrosion resistivity of the base material by alloying or protective ground coatings on the behavior of coatings is illustrated by the results of tests on light metals and iron. GN (32)

Comparative Tests on Paint Coatings: Drying Oils versus Glycerine Phthalic-acid-anhydride Condensation Products. (Vergleichende Versuche über das Verhalten von Anstrichstoffen auf der Basis trockender Öle gegenüber solcher auf der Basis von Glyzerin-Phthalsäureanhydrid- Kondensationsprodukten.) WEIL. *Korrosion und Metallschutz*, Vol. 8, March 1932, page 84. Reviews a lecture delivered before the Reichsausschuss für Metallschutz, 1931. Various possibilities of the reaction course between glycerine and phthalic-acid-anhydride exist, leading to highly molecular compounds, preferably to long chains. If other single-base acids, for instance linseed oil fat acids, wood-oil acid, etc., join the reaction, molecules are formed which combine the properties of resin with those of the applied oleic acid rest. The reaction course can be modified by changing reaction time, temperature and acid additions resulting in various products with special properties fitted for different commercial purposes. EF (32)

Black Pigments and Corrosion. (Schwarzpigmente und Korrosion.) H. WAGNER & M. ZIPFEL. *Farben Zeitung*, Vol. 37, Mar. 19, 1932, pages 876-878; Mar. 26, 1932, pages 912-913; Apr. 2, 1932, pages 944-945. Tests on black pigments, iron oxide black, bone, mineral and aniline black, natural graphite and soots (31 in all) were made with the object of finding some characteristic properties which are of paramount significance in regard to their anti-corrosive behavior. It was found that iron oxide black accelerates the drying process, which is inhibited by C of any nature. It is shown that the surface of the carrier greatly influences the length of time required for drying. In comparison with glass, sheet iron promotes drying, particularly when not grounded with nitro-cellulose. Marked differences were noticed between soots of German and American origin in regard to wetting power. The former are more readily wetted by carbo-phile, the latter by oxo-phile liquids. A correlation between wetting power and oil consumption does not exist. However direct correlations were found between orientation, dispersity, oil consumption and flow point, adsorption, drying and swelling. Rusting increased with increasing degrees of swelling and the tests gave the following order in drying: iron oxide black, bone black, mineral black, graphite, Grudeschwarz, German soot, American soot. The electrolytic corrosion however gave the following order: Fe oxide black, graphite, soots, bone and mineral blacks. This is discussed in the case of the "tube corrosion phenomenon" due to the cell Pb/electrolyte/soot. In case of graphite and Fe oxide black, the atomic oxygen is not fixed at the crystal planes but is transferred into the ineffective molecular state. Analogies are drawn with reference to Fe. Taking into account both swelling ability and electrolytic corrosion, the anti-corrosive effect of Fe oxide black is not unfavorable, that of graphite fair, while blacks and soots are unsuitable. EF (32)

Viewpoints for the Demarcation of the Applications of Oil Lacquer and Cellulose Lacquer. (Gesichtspunkte für die Abgrenzung der Anwendungen von Öllack und Zelluloselack.) HANS WOLFF. *Paper Second Corrosion Congress Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Deutsche Gesellschaft für Metallkunde & Verein deutscher Chemiker*, Oct. 17, 1932, Berlin. Mimeographed report, pages 7-8. A study on the relations between mechanical properties and composition of oil lacquer and cellulose lacquer films shows that the fields of application cannot be given *a priori*. Particularly in cellulose-oil combinations the nitrocellulose determines the character of the lacquer even when it contains an excessive share of oil. Therefore, in characterizing the fields of application those properties will be decisive which cannot be eliminated even with a heavy decrease of the cellulose. Among these properties the most important are the hardness as a valuable property and poor adherence as bad property. The frequently praised resistivity against water of nitrocellulose lacquers holds true only when such parts are not permanently subjected to water. A cellulose lacquer which begins to show cracks rapidly looses adherence, whereas an oil-lacquer needs much longer time for total destruction. The advantage of cellulose lacquers is the short time of drying. At any rate advantages and disadvantages are to be judged in every case. Examples are considered to show which one of these lacquers is to be used to greater advantage in definite cases. GN (32)

Contribution to the Quantitative Determination of the Adherence Power of Paint Coatings on Metals. (Beitrag zur quantitativen Ermittlung der Haftfestigkeit von Anstrichen auf Metallen.) E. K. O. SCHMIDT. *Farben Zeitung*, Vol. 37, Dec. 12, 1931, pages 376-377. The difficulties involved in a quantitative evaluation of the adhesion ability of coatings are discussed critically. The essential feature of the novel testing method is that small wooden blocks are glued upon the metallic carrier provided with the paint coating under test. After the drying process is finished the wooden block is loaded with weights and the adhesion power in g./unit area can be directly determined. Tests are reported and further experiments are announced. EF (32)

Gray Minium. (Graue Mennige.) A. RIEDEMANN. *Schweizerische Technische Zeitschrift*, Vol. 29, Sept. 29, 1932, pages 589-595. Paper deals with the problem of corrosion in general and with the most important paints for rust protection, with special reference to red and gray minium. Valuable rust preventing properties of the gray Pb oxides, their composition, physical properties, and mode of action are discussed. The history of the development of gray minium, the patent situation and the difficulties in processing, for instance, the best conditions for attaining the desired degree of dispersion of the finish product are considered. The advantages of gray minium in comparison with red minium are pointed out. Gray minium is better for all purposes where red minium is now used. GN (32)

Cement and Concrete as Rust Preventives. (Zement und Beton als Rostschutzmittel.) R. GRÜN. *Paper Second Corrosion Congress, Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Deutsche Gesellschaft für Metallkunde and Verein deutscher Chemiker*, Oct. 17, 1932, Berlin. Mimeographed report, pages 5-6. Cement can be used as rust preventive in 3 ways, either as pure cement, or mixed with sand or gravel as mortar or concrete, respectively. The importance of pure cement as rust preventive is still rather small. It can be used for coating transportable Fe parts, for instance, in that jute strips are soaked with it and used for protecting pipes, etc. Cement can also be used as pigment, for instance, in tar or bituminous coatings. Mortar is used to a larger extent. The various methods of protection by means of mortar are described, among which the Torkret method gains in importance. Concrete has been applied to protecting bridges since it affords protection and simultaneously mechanical reinforcement of the structure. An interesting instance of such methods is the Mellon method which has been applied to numerous bridges. GN (32)

Are there "Cheap" Iron Protection Methods? (Gibt es "billige" Eisenschutzmethoden?) H. HEBBERLING. *Chemisch Technische Rundschau*, Vol. 47, Apr. 26, 1932, pages 137-138. Only red lead exhibits pronounced anti-corrosion properties on Fe. Neither in case of Fe-oxides nor with graphite or other inert pigments could an effect be secured similar to that of red lead. A good ground coat of red lead often lasts for 3 or more paint coatings. EF (32)

Rust Protection Testing. (Rostschutzprüfung.) R. GRÜN & H. MANECKE. *Teer und Bitumen*, Vol. 30, May 1932, pages 181-186. The potential occurring during the rusting of Fe in contact with water is measured according to the compensation method (Poggendorff hook-up) using the normal calomel electrode as auxiliary electrode. No e.m.f., which can be measured, occurs unless the protective film becomes defective. The tests showed that in case of bituminous rust protective coatings, at least 3 days are required for drying and 3 successive coatings are necessary. Viscous coatings are preferable to thinly liquid ones. Bitumen melting at low temperatures should be mixed with bitumen of higher softening points. Coal tar pitch shows a remarkably good rust protection. EF (32)

Derusting of and Primary Paint Coats on Chemical Apparatus. (Entrosten und Grundieren von chemischen Apparaten.) HANS HEBBERLING. *Korrosion*, supplement to *Chemische Apparatur*, Vol. 19, May 25, 1932, pages 18-19. In the prevention of corrosion by painting a thorough derusting is essential. This may be accomplished by hand (scraping, scratch brushing, using emery, or by using blunt instruments) chemically, (dissolution of rust by acids or by suspensions of emery in mineral oils) or by sandblasting. After derusting a suitable primary coat must be applied. A form of red lead in linseed oil (preferably highly dispersed) produces most satisfactory base, an elastic, impervious film is formed. BER (32)

Highways Glisten with Deep-Sea Lusters. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 66, Mar. 1932, pages 384-386. Discussion of the use of pearl essence for finishing automobile bodies. There are 2 kinds of pearl essence, both apparently giving similar results. The first is the natural product, a silvery crystalline compound (guanin) present in the skin of certain species of fish. The other pearl essence is formulated from a synthetic product called H-scale. This material is a crystalline form of HgCl. DTR (32)

Aluminum Paint Coatings. (Aluminiumschutzanstriche.) O. GOY. *Die Umschau in Wissenschaft und Technik*, Vol. 36, Feb. 6, 1932, pages 111-112. The use of Al for paint coatings is considered and stress is laid on its advantageous application to coatings of wood in moist air and of material under the water level. Further applications mentioned are: container for gases and liquids which readily volatilize, tanks, sheet Fe roofings, masts, anti-corrosive coatings on Fe, pipe conduits, girders, cooking utensils and heating units. EF (32)

Enameling. (Über Emaillewissenschaft.) PH. EYER. *Emailletechnische Monatsblätter*, Vol. 8, July 1932, page 54; Aug. 1932, page 62. The different behavior of quartz and flint in enameling is explained by the transformation of the SiO_2 modifications. The causes of rusty spots in enamels can be too low an alkali content or too slow drying. More dangerous are rusty spots that cannot be detected with the naked eye. The addition of a rust-preventing salt is advisable. Rust can also be due to the composition of the Fe and is harder to eliminate in this case. This rust is caused by separation of Fe sulphides. GN (32)

New Ways of Surface Protection II. (Neue Wege zum Oberflächenschutz II.) A. EIBNER. *Farben Zeitung*, Vol. 37, Oct. 3, 1931, pages 13-15; Oct. 10, 1931, pages 54-55. The highly specialized chemical treatise discusses the latest advancements of paint coating technique and lists the problems still undissolved. EF (32)

Studies on a Few Chemical and Physical Properties of Majolica Enamels in Dependence on Composition. (Studien über einige chemische und physikalische Eigenschaften von Majolika-Emaillen als Funktion ihrer Zusammensetzung.) H. J. KARMAUS. *Sprechsaal für Keramik, Glas, Email*, Vol. 65, May 12, 1932, pages 352-354; May 19, 1932, pages 370-373. The technique of majolica enameling which is chiefly used for cast iron stoves is first described in detail. 2 types of corrosion of such enamels are to be distinguished. In the case of too high a content of PbO iridescent spots are apparent which cannot be removed or in the case of too high a content of alkalies deposits appear which can easily be removed. Methods are given for numerically determining the extraction of such enamels by acids and water. 8 various compositions of unfit as well as stable majolica enamels were tested. No fixed compositions can be given since the stability against acids does not depend merely on the absolute value of the PbO content, nor the stability against water merely on that of the alkali content but both of the properties strongly depend also on the ratio of the other ingredients. The described methods can be adapted only to majolica enamels not to other enamels free from PbO. Pb-free majolica enamels have not yet proved successful. As composition of a majolica enamel which turned out well the following is given: SiO_2: 22.5%, PbO: 56.9%, NaF: 1.3%, BaO: 3.6%, AlF_3: 1.1%, Na_2O: 5.7%, B_2O_3: 8.9%. 9 references. GN (32)

Some Developments in the Use of Zinc Pigments. H. A. NELSON. *Journal American Zinc Institute*, Vol. 14, 1931, pages 60-68. The use of Zn pigments is considered under 3 headings: (1) Zn sulphide pigments in exterior paints, (2) Zn pigments in special moisture-resisting paints for wood, and (3) metallic Zn powder (Zn dust) as a pigment in protective coatings for metal. With regard to the latter the results of severe exposure tests on paints of different compositions used on Al, galvanized Fe and sheet Zn are given. See also *Metals & Alloys*, Vol. 2, Oct. 1931, page 233. **(32)**

Faults in Enameling Due to Faulty Construction of the Raw Product. (Emailfehler als Konstruktionsfehler der Rohware.) H. J. KARMAUS. *Sprechsaal für Keramik, Glas, Email*, Vol. 65, July 7, 1932, pages 494-496; July 14, 1932, pages 516-518. The first part of the paper discusses the principal conditions for properly enameling sheets with special reference to the shaping process and the mechanical stresses set up during working. The proper thicknesses of sheet products to be enameled are considered. The second part is given to a discussion of points to be borne in mind in enameling castings with either too thin a wall thickness or non-uniform wall thickness. The effects of careless treatment other than in the fabrication are treated. GN (32)

The Stability of Rust Preventing Paint Coatings on Different Steels. (Die Haltbarkeit von Rostschutzanstrichen auf verschiedenen Stahlsorten.) K. DAEVES. *Farbe und Lack*, Vol. 36, May 20, 1931, pages 242-243. Panels of ordinary Thomas, open-hearth, Cu-bearing "Patina" steel and Armco Iron in untreated and galvanized state were provided with red lead ground coat and iron oxide paint and then exposed for 2 years to atmospheric corrosion attack of the Ruhr district. The coatings on Armco Iron and patina steel displayed a greater stability than those on Bessemer and open-hearth steels. EF (32)

Red Lead and Red Oxide. H. N. Bassett. *Engineering,* Vol. 134, Aug. 19, 1932, pages 225-226. Discusses relative merits of red lead and red oxide as protective coatings for Fe and steel. Red lead is more satisfactory because it renders steel surfaces to which it is applied somewhat passive. This postpones corrosion and reduces loss by rusting. A red lead paint film is less permeable than one of red oxide. After consideration of these and other factors, red lead seems to be more satisfactory than red oxide. LFM (32)

Rules for Foundries and Enameling Plants. (Richtlinien für Giessereien und Emaillerwerke.) Gustav Krebs. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Oct. 16, 1932, pages 409-411. Points discussed are to be borne in mind in melting cast Fe for enameling purposes. Good results in enameling can be obtained only when the graphite is finely distributed in the matrix which is attained by high melting temperature and slow cooling of the casting. A good kitchen ware Fe contains about 3.5% C, 2.5-3% Si, .5-.6% Mn, .8-1.0% P and .08-.1% S. S contents above .1% are detrimental in that the enamel then tends to cracks and holes. There are further discussed suitable composition of the molding sand and the surface conditions of the casting. Thin walled castings should not be kept in the mold for too long a time. The temperature in enameling should be carefully supervised and controlled. Enameling furnaces in which the pieces to be enameled can be rapidly heated up are better than slowly heating ones. The piece is first ground coated and then cover enameled. Suitable compositions of such enamels are given. GN (32)

The Deposition of Sulphide Films on Metals. (Ueber die Abscheidung von Sulfidfilmen auf Metallen.) E. Beutel & A. Kutzelnigg. *Monatshefte für Chemie,* Vol. 58, Oct. 1931, pages 295-306. Experiments have shown that sulphides can be deposited electrolytically, or, in some cases, even without current by means of a contact metal, from hyposulphites soluble in water. Au, Pt and Pd sulphides are deposited anodically, Pb, Sb, Bi, Mn, Fe, Ni and Co sulphides cathodically. Cu and Ag sulphide could not be deposited electrolytically but by a contact metal. Anodic deposits can contain free S, cathodic deposits free metal (NiS). The method of obtaining the deposits is described for all metals and the possibility mentioned that these films might find practical application in rectifiers and photocells. Ha (32)

Enameling and Enamel Painting. (Emaillieren und Emailmalen.) Lothar Bucher. *Deutsche Goldschmiedezeitung,* Vol. 35, Mar. 12, 1932, pages 109-112; Apr. 9, 1932, pages 148-150; May 7, 1932, pages 189-191. Detailed discussion of the enameling of gold ware. GN (32)

Organic Protective Coats for Metals. (Organische Schutzüberzüge von Metallen.) E. Liebreich. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Feb. 6, 1932, pages 140-141. The nature and behavior of different materials for protecting Fe and other metals from corrosion are reviewed; paints, pigments, artificial resins, tar varnishes and dissolved caoutchouc are discussed with regard to their applicability for various purposes. Ha (32)

Faults in Enameling due to Faulty Construction of the Raw Product. (Emailfehler als Konstruktionsfehler der Rohware.) H. J. Karmaus. *Sprechsaal für Keramik; Glas, Email,* Vol. 65, July 7, 1932, pages 494-496. The paper discusses principal conditions for properly enameling sheets and castings with special reference to shaping process and mechanical stresses set up during working. The proper thicknesses of sheet products to be enameled are considered. 11 references. GN (32)

Tar Plant for Rolled Iron. (Teeranlage für Walzeisen.) A. Lobek. *Werkstattstechnik,* Vol. 26, Feb. 15, 1932, pages 68-70. Describes furnace heated with mixed gas and tar vessel for quantity production; profiles and railroad ties are tarred. Ha (32)

Evaluating the Tests on Visual Appearance of Paint Coatings with Particular Reference to the Rusting Degree. (Zur prüftechnischen Bewertung der äusseren Beschaffenheit von Farbanstrichen, insbesondere ihres Rostgrades.) R. Kempf. *Farben Zeitung,* Vol. 37, Oct. 31, 1931, pages 161-163. The general part refers to the testing of optical, mechanical, structural properties (4 methods each) and to the detection of foreign matter due to 4 different sources. The second part of the paper pertains to the determination of the rusting degree. A novel logarithmic rust scale is suggested as a substitute for the 6 standards of the "Deutscher Verband für die Materialprüfung der Technik (VDM). Both tables compare as follows:

	Rusted area in % of coated surface according to:	
Group	Proposal of VDM	Author's suggestions
R_0	0%	0% (0.0- 0.1%)
R_1	0.8% (0.5-1%)	1% (0.7- 1.3%)
R_2	5%	3% (2 - 4 %)
R_3	15%	10% (7 - 13 %)
R_4	35% (30-40%)	30% (23 - 41 %)
R_5	>50%	100% (74 - 100 %)

The new evaluation method is demonstrated by 6 paint coated Fe samples which were submitted to outdoor corrosion during a period of 2½ years. EF (32)

The Atrament Process for Rust Protection of Iron and Steel. (Das Atramentverfahren zum Schutze von Eisen und Stahl.) E. Klapper. *Metallwaren-Industrie und Galvano-Technik,* Vol. 29, Sept. 1, 1931, pages 383-384. Shop instructions are furnished for carrying out the Atrament coating practice which aims at a corrosion protection of Fe due to heavy metal phosphates. EF (32)

Considerations on the Fluorides used in Enameling. (Betrachtungen über die in der Glas- und Emailindustrie gebräuchlichen Fluoride.) H. J. Karmaus. *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Jan. 7, 1932, pages 8-9. The paper especially refers to the vaporization of F in the F minerals (cryolite, synthetic cryolite, CaF_2, Na_2SiF_6) used for making white turbid enamels and as flux. Difficulties encountered in melting enamels containing Na_2SiF_6 are discussed. 9 references. GN (32)

Testing Methods for the Determination of Milling Fineness and Coating Thickness of Enamels. (Prüfungsmethoden zur Bestimmung der Mahlfeinheit und Auftragsdicke von Emaillen.) H. J. Karmaus. *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Mar. 3, 1932, pages 160-161. Description of the sieving method for testing the fineness and of the cylinder test for examining the coating thickness of enamel batches as they have been first used in America and improved by Vielhaber in Germany. For both methods it is of great importance that the batch is always ground in the mill with the same amount of water. GN (32)

The Effect of Metals, which accelerate the Drying Process, on the Physical and Chemical Properties of Linseed Oil Coatings. (Über die Wirkung der verschiedenen trocknungsbeschleunigenden Metalle auf die physikalischen und chemischen Eigenschaften von Leinölfarbfilmen.) F. Wilborn, F. Wachholz, O. Walter & H. Ulrich. *Farben Zeitung,* Vol. 37, May 7, 1932, pages 1120-1121; May 14, 1932, pages 1156-1158. The tests include Co, Mn, Pb, Ce and Th. The physical properties of the films were tested with the Wolf-Zeidler Rumpometer. Mn and, to a more pronounced degree, Co yield elastic and easily saponifiable films. The behavior of the different metals was noticed and the marked alkaline resistance of the Ce films is emphasized. EF (32)

Cover Coats for Sheet Steels. Ludwig Stuckert. *Ceramic Age,* Vol. 20, Sept. 1932, pages 97-100. Enamels for metal coating are discussed with regard to mechanical resistance and proper expansion coefficients. A number of compositions as given in various publications are listed. 6 references. Ha (32)

Aluminum as Protective Paint Pigment. (Aluminium als Schutzanstrichfarbe.) P. Urech. *Schweizerische Technische Zeitschrift,* Vol. 29, Oct. 6, 1932, pages 614-616. Processing and testing of Al bronze powder (pure Al of over 99% purity) is first discussed. Preparation of coating, surface to be coated and properties with special reference to corrosion protection are considered. Al coatings have a high resistivity against S bearing fumes and H_2S, they are particularly used for protecting steel constructions. GN (32)

New Improved Testing Method for Lacquer Coated Wires. (Neues verbessertes Prüfverfahren für Lackdrähte.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Sept. 4, 1932, page 469. The common testing method in which the lacquered wire is moved through a Hg bath under voltage was replaced by a mechanical-electrical testing method which is better for detecting failures in coating and distinguished by a higher testing speed. Wire tested can be used again, which is not case in Hg method due to Hg particles adhering to wire. GN (32)

Ground Coats for Cast Iron. Ludwig Stuckert. *Ceramic Age,* Vol. 20, Aug. 1932, pages 60-65. The fundamental principles underlying the compounding of enamels, the treatment of the metal for enameling and the influence of temperature of the enameling process on the losses are discussed and recipes for enamel compositions for different purposes are given. 10 references. Ha (32)

Report on the Second Session on Enameling Technique, March 5-7, 1932, at Leipzig. (Bericht über die 2. Emailletechnische Tagung vom 5.-7. März 1932, in Leipzig.) *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Mar. 24, 1932, pages 223-224. The following papers were presented: L. Vielhaber: Fish Scale in sheet enamels, as previously abstracted. Karmaus gave a survey on the recent technical progress in enameling, dealing with new feldspar deposits in the Saar Basin, boron mineral deposits in California, new opacifiers, rust preventing salts, improvements in drying, furnaces and control, outlook of enameling. W. Kerstan reported on measurements of thermal expansion of various cast enamels to avoid hair cracks and spalling. The expansions of Fe and enamel were studied with a Chevenard apparatus between room temperature and the softening points of the various enamels. Considerable deviations between the calculated and actually measured values of thermal expansion were found. The values satisfactorily agree only below 100° C. A survey is given on the properties which are of decisive importance for proper adherence of enamels, as elasticity, strength, thermal treatment, etc. GN (32)

The Principal Operations and Equipment in Enameling. (Die hauptsächlichsten Arbeitsgänge und Einrichtungen beim Emaillieren.) *Sprechsaal für Keramik, Glas und Email,* Vol. 65, Oct. 20, 1932, page 762. This second instalment of the paper deals with storing, weighing and mixing of the raw materials of enamels. GN (32)

A New Rust Protection. (Ein neuer Rostschutz.) *Apparatebau,* Vol. 44, Sept. 16, 1932, page 131. Brief mention of a new rust preventing compound which avoids the disadvantages of rust preventing paints in that it forms a chemical compound with both the Fe to be coated and the rust formed. By the chemical action of "Edgerol," marketed by Eduard Gerlach, Lübbecke, Westf., Germany, tight adhering of the cover coating to the base metal is guaranteed. Edgerol coatings can be made with the brush, spraying or dipping. GN (32)

Testing of Paint Coatings for Bending Strength and Adhering Power. (Zur Prüfung von Anstrichen auf Biegefestigkeit und Haftvermögen.) R. Kempf. *Farben Zeitung,* Vol. 37, Feb. 13, 1932, page 697. See *Metals & Alloys,* Vol. 3, June 1932, page MA 191. EF (32)

Coating, Spraying, Decorating and Burning of Sheet Ware Enamels. (Auftragen, Spritzen, Dekorieren und Brennen von Blechwaren.) Wilhelm Greiner. *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Jan. 14, 1932, pages 28-29. Discussion of the various procedures and advantages of various methods. Composition of raw and finish enamels are given. GN (32)

The Parker and Bonderite Processes with Particular Reference as a Metallic Carrier for Paints. (Das Parker und Bonderite Verfahren mit besonderer Beachtung des anstrichtechnischen Standpunktes.) Fr. Kolke. *Farben Zeitung,* Vol. 36, June 20, 1931, pages 1687-1690; June 27, 1931, pages 1727-1728. The Parker and Bonderite Methods of treating metals, the underlying principles and commercial accomplishment of the corrosion prevention processes are described. Experiments were carried out with 10 different paints applied to test pieces of parkerized and untreated metal. The corrosion resistance against the following solutions was checked after 4, 12, 15, 27, 40 and 45 days: H_2O, 10% NaCl, 5% H_2SO_4, 10% NaOH solutions and 99.8% alcohol. Generally speaking, the durability of the paints on parkerized panels was superior. This holds particularly true for NaCl solutions while the untreated panels turned out better in H_2SO_4 as the corrosion medium. The following table is included in the paper showing the marked resistance of parkerized mild steel in various liquids as compared with other surface protection methods, determined by changes in weight of 75 g. samples. In another set of tests the samples were primed with red lead, then finished variously and exposed to drain water from coke and to atmospheric corrosion. After a testing time of half a year, the superiority of the parkerized and bonderized panels showed up distinctly. The good adhesion of paints to the surface-treated metals is considered and the possibility of replacing the priming of metals (particularly with red lead) by parkerizing and bonderizing is discussed.

	Air	Tap Water	Sea Water	Co_2 Water	Water Rich in Air	Steam	1% NH_3	5% Acetic Acid	5% Javelle Water	5% Na_2CO_3	5% $NaHCO_3$	5% Na-bisulphite
Steel (polished):	+13	—52	+44	—55	+ 3	+38	—47	—512	—124	+ 1	+ 8	— 39
Phosphatized:	0	0	+ 1	0	+ 1	0	+ 1	— 80	— 4	— 4	— 3	— 65
Red lead:	0	— 2	—33	— 2	— 1	—68	— 4	—211	— 63	—12	—26	—117
Ni plating:	+ 3	—32	—27	—16	— 3	— 9	—25	—590	— 40	— 1	0	—136
Fire tin plating:	+ 1	0	— 9	— 1	0	+ 1	0	— 78	0	—15	—16	—121
Galvan. tin plating:	+ 1	+11	+27	—32	+ 7	+ 7	— 1	—669	+ 3	+ 7	+36	—243
Galvanizing:	+ 1	+ 7	+23	—28	+ 6	+ 6	+ 2	—436	+ 5	+13	+32	— 65
Sherardizing:	+ 2	+15	+23	—28	+13	+13	+ 1	—690	0	+30	+43	— 42

EF (32)

Rust and Corrosion Protection by Phosphate Coatings. Corrosion Protection by Coatings on India-Rubber Base. (Rost-und Korrosionsschutz durch Phosphatüberzüge. Korrosionsschutz durch Überzüge auf Kautschukgrundlage.) SACHS. *Paper Second Corrosion Congress, Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Deutsche Gesellschaft für Metallkunde and Verein deutscher Chemiker,* Oct. 17, 1932, Berlin. Mimeographed report, page 9. In the phosphate coating method a crystalline coating is formed on the metallic surface by chemical treatment. The conditions for attaining by this method coatings of highest protective properties are considered. Such coatings are superior to other non-metallic coatings and also metallic protective layers. The coating methods with phophates vary with the object and the requirements of protection. Coatings on india-rubber base are the most resistive known against various organic media and acids. The rather low corrosion resistivity of common unsaturated india-rubber is considerably increased by saturation with S or Cl. Properties, coating methods and use of india-rubber base coatings are considered. GN (32)

Enamel as Protection against Corrosion. (Email als Korrosionsschutz.) SALMANG. *Paper Second Corrosion Congress, Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Deutsche Gesellschaft für Metallkunde and Verein deutscher Chemiker,* Oct. 17, 1932. Mimeographed report, pages 3-4. The paper discusses at length the protection of cast Fe and steel sheets by enameling. The protection of the surface depends on the processing of a uniform continuous enamel layer. Any cracks or insufficient adherence may start the corrosion of the metal. The methods for testing the freedom from cracks and the adherence are dealt with. During the use of enameled objects corrosion can be started by injuries due to mechanical or thermal shocks. Mechanical failures can hardly be avoided but the deteriorating effects of thermal shocks can be counteracted by various means during the enameling process. The corrosion of the metal can also be started by the corrosion of the enamel itself. Therefore, the composition of enamels has to be chosen according to the liquids in and the temperatures at which they are used. Methods for testing the corrosion stability of enamels are considered. Enamels of highest stability against hot and concentrated acids contain smaller amounts of alkalies and boric acid. GN (32)

Unsolved Problems of Iron Protection by Coatings. (Ungelöste Problems des Eisenschutzes durch Anstrich.) H. WOLFF, F. WILBORN & E. WACHHOLTZ. *Farben Zeitung,* Vol. 37, Oct. 10, 1931, pages 52-53; Oct. 17, 1931, pages 91-92. The present state of research on pigments and binding agents for corrosion-proof paint coatings, their manner of application, the disintegration of films, the influence of organisms, wear, local atmospheric conditions and the peculiarities of the carrier Fe are critically discussed. EF (32)

ORE CONCENTRATION (33)

Refractoriness. H. A. WHITE. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, June 1932, pages 333-334. Discussion. See *Metals & Alloys,* Vol. 3, July 1932, page MA 231. AHE (33)

Classification (33a)

The Andrews De-Slimer. *Industrial Chemist,* Vol. 8, June 1932, pages 229-230. A brief description of the construction and operation of the Andrews De-Slimer, a novel type of machine for carrying out the process of "hydrodynamic classification," (the separation of fast from slow settling particles and from the liquid medium in which both are suspended. RAW (33a)

Resonance-Swing Sieves. (Resonanz- Schwingsiebe.) H. BINTE. *Kohle und Erz,* Vol. 29, June 1932, pages 170-175. The methods formerly applied to the classification of ores or coal are briefly summarized. Advantages and disadvantages of rolling grates, trammels, screens, eccentric sieves, double crank sieves, pusher-type sieves and swing sieves are considered. A new type of swing sieve, built by the Bamag-Meguin Company is then described which is claimed to offer the following advantages: easy and quiet play, no transmission of the swinging motion on the building, exceptionally low power consumption which amounts only to a fraction of that used for the other system of sieves, high capacity, about 2 or 3 times that of the older types for the same sieve dimensions, increased purity of the products sieved, careful treatment of products sieved and simple attendance. GN (33a)

Flotation (33c)

Chemical Activity the Cause of Flotation? OTIS D. WELSCH. *Engineering & Mining Journal,* Vol. 133, Oct. 1932, pages 529-532. A study of the reason for flotation as the result of buoyance created by the development of a volatile substance at the surface of the particle. It appears probable that a mineral particle obtains transportation to the surface primarily by means of bubbles resulting from chemical reaction at its surface. Opinions of many observers are discussed and a brief bibliography is appended. WHB (33c)

Electrostatic Potentials at the Phase Boundry Electrolyte—Inert Electrode and the Physical Chemistry of the Flotation Process. (Elektrostatische Potentiale an der Phasengrenze Elektrolyt—unangreifbare Elektrode und die physikalische Chemie des Flotation Prozesses.) B. KAMIENSKI. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 158, Feb. 1932, pages 441-444. The interpretation of the flotation phenomenon on the basis of cata-phoretic potentials leads to results which are in disagreement with actual observations. Since these potentials are playing a role at a certain distance from the phase boundary, while the particles are completely wet, the failure of the cataphoretic theory should be expected. But the electrostatic potentials occurring at the phase boundaries of inert electrodes in aqueous electrolytes are reduced appreciably in accordance with the theory by the additions of organic compound emulsions (turpentine oil + potassium xanthogenate). The addition of minute quantities of the emulsion, for instance 1 part of turpentine oil + 1 part of potassium xanthogenate to 625,000 parts of a 2/1000 *N* KCl solution, cuts down the potential of a Pt-electrode for 100 m volts. A similar effect, although to a smaller extent, is noticed on other electrodes, such as galena and graphite. EF (33c)

Surface Activity and Surface Tension as a Method of Investigation of Flotation Reagents. M. E. LIPITZ & M. M. RIMSKAYA. *Tzvetnuie Metallui,* No. 5, May 1931, pages 594-610. In the first of a series of reports on an investigation of the role of surface tension and surface activity in flotation the methods of surface tension determination are reviewed, and a special apparatus developed by Rebinder is described. Some applications of various measurements are given: (1) Determination of purity and characteristics of flotation reagents from their surface activity, (2) determination of characteristics of flotation oils from their surface tension on the water-oil boundary, (3) determination of solubility and content of acid and alkaline flotation reagents by means of a capillary manometer, (4) determination of the influence of the reaction of the surrounding medium on the activity of flotation reagents, and of the optimum conditions for their action, (5) determination of adsorption of flotation reagents by the pulp. By means of surface tension measurements authors determined: (1) The solubility of naphthyl amine hydrochloride and m-xylidino-, m- and p-cresols, n-caproic and n-heptoic acids in water, (2) effect of the pH of the medium on the surface activity of flotation reagents (p-toluene sulphonic acid and α-naphthyl amine) distributed between 2 immiscible liquids, water-toluol, water-benzol, (3) the flattening of the meniscus on the benzol-water surface caused by alkalis and hydrolyzing salts, (4) the partition of a flotation reagent (p-cresol) between water and benzol, and its adsorption isotherm on water-benzol boundary. Results given in tables and curves. BND (33c)

Froth Formation and Flotation Ability of Powders in Solutions of Surface Active Substances. N. M. LUBMAN. *Tzvetnuie Metallui,* July 1931, pages 854-866. The second of a series of reports of investigations of flotation conducted by the colloidal laboratory of the Institute of Non-Ferrous Metals (Russia) is summarized as follows: (1) The froth forming ability and the stability of the froth were determined in aqueous solutions of iso-amyl alcohol, alpha-naphthyl amine and m-cresol at different concentrations of the frothers. (2) In all cases the maximum frothing was found at small concentrations before the saturation of the adsorption layer had been reached. In saturated aqueous solutions of the reagent the froth formation is nil for iso-amyl alcohol and m-cresol (neutral and acid reagents). For alkaline reagents it is small. On shaking saturated solutions a fairly stable emulsion is obtained. (3) The kinetics of the spontaneous destruction of the froth under different conditions was determined. (4) The frothing ability of neutral, acid and alkaline reagents was investigated at various values of pH. As a rule neutralization of acid and basic frothers (adding NaOH to cresol and HCl to naphthyl amine) accompanied by dissociation of surface active molecules into inactive ions, causes a sharp decrease of the frothing ability simultaneously with the lowering of surface activity (adsorption). These results make it possible to determine the optimum conditions for froth formation. (5) The flotation ability of some typical minerals (calcite, barite, talc, graphite) in solutions of the investigated frothers at different pH and concentrations was investigated. It was found that the maximum flotation either coincides with the maximum froth formation or is slightly shifted on account of adsorption. There appears to be certain hysteresis in flotation. The collecting ability and the stability of the 3 phase foam were studied. Dissociation of the molecules of basic and acid frothers caused by the addition of HCl and NaOH increases flotation because on the surface of the solid particles the ions are more active (stronger adsorption) than molecules on the solution-air boundary. The maximum flotation ability of a dissociated frothing agent coincides with the maximum stability of a 2-phase froth with undissociated frother. BND (33c)

Determination of Contents of Flotation Agents in Aqueous Media by Means of Surface Tension Measurements. M. E. LIPITZ & M. M. RIMSKAYA. *Tzvetnuie Metallui,* Nov. 1931, pages 1432-1442. *Physico-chemical discussion of the flotation process and its practical applications,* IV. This is the fourth of the series of reports from the Colloidal Laboratory of the Institute of Non-Ferrous Metals (Russia). The authors describe the application of the capillary manometer method of titration for determinations of concentrations of pure flotation reagents and their mixtures. By means of this method the solubilities of a series of difficulty soluble flotation reagents in water at 20° were determined. BND (33c)

On the Influence of Active Carbon on the Flotation of Ore. (Ueber den Einfluss aktiver Kohlen auf die Erzflotation.) ROBERT BRAUNSTEIN. *Kohle und Erz,* Vol. 29, July 1, 1932, pages 190-195. The principal results of this investigation on the influence of various types of active C on the flotation of some ores are as follows: (1) Very small amounts of active C hinder flotation in that the formation of the flotation froth is hindered or the head is precipitated. (2) This effect which is proportional to the amount and the activity of the C, probably is due to adsorption of flotation oil on the C so that the oil can not fulfill its actual purpose. (3) By comparative adsorption measurements and flotation tests it could be shown that the intensity of adsorption of flotation oil on ore and gangue, on the one hand, and on the active C, on the other hand, is the prime factor to elucidate these occurrences. (4) When smaller amounts of an active C are added to the flotation solution than are necessary for a complete destruction of the froth the flotation of the gangue is hindered. (5) Flotation tests on galena and Cu pyrite with small amounts of active carbon and in using oleic acid as flotation oil showed that the active carbon precipitates the gangue from the froth so that the metal content of the froth is increased. (6) Tests to differentially separate galena and sphalerite with the addition of active carbon indicate the possibility of using this method in practice. (7) Indications are that other flotation processes used in practice can be abbreviated considerably by using active carbon. (8) Tests with galena mixtures of various dispersities and fine-grained quartz show that active carbon leaves in the head coarse galena which is hard to float whereas the fine-grained quartz which otherwise is easier to float, is precipitated. (9) In replacing oleic acid by the common technical flotation media the above mentioned occurrences are not influenced. 10 references. GN (33c)

Amulet Flotation Mill Practice. W. G. HUBLER. *Transactions Canadian Institute of Mining & Metallurgy,* 1931, pages 247-262. See *Metals & Alloys,* Vol. 3, May 1932, page MA 154. AHE (33c)

Floating Gold on the Mother Lode. MAX KRAUT. *Mining Journal,* London, Vol. 178, Aug. 6, 1932, pages 531-532. Flotation practice for Au ore in various California mills is described. AHE (33c)

Recent Changes in Milling Practice at Brittania. W. G. HATCH. *Transactions Canadian Institute of Mining & Metallurgy* (in Canadian Mining & Metallurgical Bulletin No. 244), Aug. 1932, pages 323-334. The flow sheet of the Brittania mill is described. Forrester flotation cells have been substituted for M.S. machines. Advantages from the change include savings of approximately 0.10 lb. pine oil, 0.6 kw.-hr., and 0.30 cents maintenance charge per ton of ore, 1 man per shift, less Cu loss in tailings, an increase of 1.5% in the grade of concentrate and an increase in machine capacity per unit of floor space. Results for 1927 and Oct. 1931, were, respectively: tons milled per day 3707, 6248; Cu in concentrates 19.927%, 27.06%; Cu in tailing 0.158%, 0.116%; direct milling costs 36.8, 18.27 ¢/ton; and total milling costs 43.0, 20.48 ¢/ton. The Cu concentrate (Oct. 1931) averaged Cu 27.06, Fe 29.3, S 35.90, Zn 2.90, insoluble 3.0%, Au 0.06 and Ag 2.42 oz./ton; the pyrite concentrate Cu 0.23, Fe 44.9, S 50.46, Zn 0.10, insoluble 3.2%, Au 0.01 and Ag 0.40 oz/ton. AHE (33c)

Magnetic Separation (33d)

Investigations on Magnetic Separators. (Nagot om magnetiska malmseparatorer.) G. G. BRING. *Jernkontorets Annaler,* Vol. 116, June 1932, pages 255-278. Magnetic field strengths were mapped on several Swedish separators for coarse and finely crushed ores. For coarse separation the lines of force average 800-900 per cm.^{2}, but ran as low as 400-500 for concentrating Fe ore from middlings. For fine separation a strength of 2000 was required for feebly magnetic ores, but 800-900 is sufficient when the crushed ore is to be lifted out of water. HCD (33d)

Granites and Syenites as Raw Products of the Glass and Ceramic Industry. (Granite und Syenite als Rohstoffe der Glas- und keramischen Industrie.) BARTEL GRANIGG. *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Mar. 3, 1932, pages 155-158. A new type of magnetic separator is described which recently has been developed at the Montanistische Hochschule, Leoben, Austria. The so-called "worm gear separator" uses a principle entirely different from the known cross-conveyor or ring separators. The disadvantages of the latter 2 types, large pole distance in the separating zone and air gap between material to be separated and the working pole, are eliminated. In the worm gear separator the pole distance is 1 mm. or a few mm. according to the grain size of the material. The magnetic resistance as thus decreased permits producing economically, flux densities of 14,000 lines of force/cm.^{2}, thus generating magnetic fields which hitherto could not be attained for ore concentration. The construction is described in detail. The reported tests show that the Fe-bearing constituents of granites and syenites were removed practically quantitatively. The separator is to be used for separating fine Fe ores with grain sizes from 0-20 mm. GN (33d)

REVIEWS OF

MANUFACTURERS' LITERATURE

Stainless Steel

A chromium-iron alloy which resists high-temperature oxidation up to 2150° F. is described in Bulletin S-55 distributed by the Allegheny Steel Company. The leaflet gives the chemical composition of the alloy and its physical properties. The sizes and shapes in which it is obtainable are indicated. (117)

Beryllium Copper

An interesting pamphlet from the American Brass Company discusses Beryllium Copper, a new alloy possessing excellent physical properties which may be greatly increased by heat treatment. The beryllium content varies from 1 to 2.25% with the balance pure copper. This series of alloys is suggested for use in fuse clips, instrument springs, thermostatic control springs, etc. (118)

Welding Enduro Stainless Steels

A 16-page booklet issued by the Republic Steel Corporation contains comprehensive information on various welding methods as applied to different types of Enduro stainless steels, the methods discussed being electric arc welding, gas welding, spot and projection welding, seam welding and flash welding. The data are the result of research by the company's welding engineers. (119)

Refractories

The 5th Edition of the catalog of the General Refractories Company illustrates the different kinds of brick produced by them, one whole section being devoted to tables of general information which will be found useful and time saving. (120)

Furnaces

The Fuel Division of the Electric Furnace Company has issued a pamphlet which shows their fuel fired furnaces and material handling equipment for industrial heating processes. An interesting feature of the pamphlet is a chain hearth furnace for handling small pieces of material without the use of pans or containers. (121)

Quenching Oils

The Research Staff of E. F. Houghton & Co., Philadelphia, Pa., has prepared a 69-page treatise which outlines the process of heat-treating of steel with particular emphasis on the quenching operation. Various quenching media and their properties are discussed. The facts in the booklet are the results of research and analytical laboratory tests in addition to information gained from years of actual practice in many of our largest industries. (122)

Welding Electrodes

P. R. Mallory & Company has issued two leaflets which welders will find interesting. The first, "A Miss is as Bad as a Mile," shows correct and incorrect types of water-cooled electrodes; the second, "Mushrooms are all Toadstools in Welding," recommends the use of electrode die materials of Elkonite or Elkaloy for longer service and hence, reduction in costs. (123)

Alloys for Electrical Resistance

For data on electric alloys, Catalog R-28 of the Driver-Harris Company, will be found useful. It gives the description and uses of their "Nichrome," "Nichrome IV," "Lucero," "Manganin," and "Comet" alloys covering all classes of electrical applications from pit type furnaces to curling irons. (124)

Metallographic Microscope

A booklet compiled by Carl Zeiss, Inc., is a most complete and detailed description of their large metallographic microscope. In addition to descriptions and illustrations of its various parts, some suggestions for its operation are given. (125)

Wrought Iron

In answer to the question "How do you make wrought iron?" the A. M. Byers Company has prepared a booklet entitled "The New Story of Ancient Wrought Iron." In it the process of the manufacture of wrought iron is made clear with the aid of numerous illustrations. (126)

Alloyed Iron

A number of alloyed irons containing Ni, Cr and Mo produced by the Cramp Brass & Iron Foundries Company are grouped under the name "Elfur" and are described in a leaflet sent out by the company. These alloys are suited for drawing dies, forming dies, piston rings, brake drums, cam shafts, gears, etc. Another of the company's leaflets is devoted to their superstrength bronze, giving its physical characteristics and suggesting its application in bushings, pipe fittings, pressure castings, etc. (127)

A New Welding Method

A leaflet received from the Metal & Thermit corporation tells of a new welding method for use when heavy plates are joined. The so-called Straight Gap welding is used instead of Vees or U gaps. In this way the plates may be used just as they come from the mill, or flame-cut plates may be welded without removing the smooth surface oxide from the edges. The method is outlined in the leaflet. (128)

Mechanical Gas Producer

Bulletin No. 92 of the Wellman Engineering company describes their mechanical gas producer for gasification at extremely high rates. One section is devoted to economies secured by the work of Wellman producers in open hearth steel works, glass factory and sheet steel mill. (129)

Corrosion Protection

A new booklet prepared by the Roessler & Hasslacher Chemical Company, describes their improved zinc cyanide process and the Cad-A-Loy process. The former is recommended for a cheap highly rustproof finish on steel, while Cad-A-Loy coatings (cadmium-mercury) are particularly suitable for cast or gray and malleable iron. Another booklet sent out by the same company discusses their cyanides and salts for case hardening and heat treatment of steel. (130)

METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

I should like a copy of each piece of Manufacturers' Literature listed below.

.....

Name.....

Position..... Firm.....

Street and Number.....

City..... State.....

Jig Boring Machine

Catalog No. 560 of the R. Y. Ferner Company discusses a new model of a jig boring machine designated as MP-2C. It has a capacity of 8x12" and several unique features which adapt it to rapid laying out, drilling and boring of holes up to 1½" even in direct production of small series of parts in the lighter manufacturing industries. (131)

Zinc Die Castings

An interesting booklet published by the New Jersey Zinc Company is devoted to their Zamak die casting alloys, giving the results of various tests on these alloys and showing a number of illustrations of unique and interesting uses of zinc die castings. A chart prepared by this company gives the physical properties of die cast Zamak alloys. (132)

Electric Weld Pipe

A most attractive pamphlet sent out by the Republic Steel Corporation records the development, the manufacture and the advantages of their new electric weld pipe. Tables which are included show the safe working pressures for different diameters of the pipe. (133)

Combating Chemical Corrosion

A booklet issued by the Aluminum Company of America recommends the use of Alcoa aluminum and its alloys for the construction of chemical apparatus and equipment. A list is given which shows the effect of various chemical reagents on aluminum. (134)

Linings

Bulletin No. 1 of the Stebbins Engineering & Mfg. Company discusses their acid, alkali and corrosion resisting linings for industrial equipment and lists a number of instances in which they can be used to advantage. (135)

Metal Melting Firepot

The Turner Brass Works have sent out a leaflet descriptive of their metal melting firepot No. 76B with flame control and self-cleaning jet. The fuel can be either gasoline or kerosene. (136)

Metallurgical Furnaces

The Monarch Engineering & Mfg. Company has prepared a number of sheets illustrating their metallurgical furnaces for various purposes. Prices are given. (137)

Quartz Monochromator

The Bausch & Lomb Optical Company has developed a new quartz ultraviolet monochromator which is described in a leaflet recently issued by them. (138)

For Drying Air and Gases

An interesting new development is the Lectrodryer, "Activated Alumina" System, designed and worked out by the Pittsburgh Lectrodryer Corporation in collaboration with the Aluminum Company of America. The unit can be connected directly to any air or gas line and when it has absorbed moisture to its full capacity it may be reactivated and the cycle repeated indefinitely. A complete description will be found in a folder issued by the Pittsburgh Lectrodryer Corporation. (139)

Nickel's Worth

An entertaining little pamphlet written by Floyd Gibbons for the International Nickel Company tells of the manifold uses of nickel in everyday life. (140)

TAM Daily Reminder

The Titanium Alloy Manufacturing Company is issuing monthly a little pocket diary, the April issue being the first. These booklets contain technical comments and data of interest to the metallurgical industry and will be sent to anyone requesting them on his company's letterhead. (141)

High Temperature Bonding Mortar

A leaflet from the Harbison-Walker Refractories Company recommends their Harwaco bond for laying either high-alumina or fireclay brick. It may be used to advantage where high temperatures prevail because of its refractoriness and may be applied without the necessity for expert labor. Directions for its use are included in the leaflet. (142)

Handbook of Electric Weld Tubing

An attractive 67-page booklet issued by Steel & Tubes, Inc., gives a brief description of the manufacture of electric weld tubing by the Johnston process together with engineering and standard practice information for purchasers and users of tubing. (143)

Portable Tensile Testing Machine

The Linde Air Products Company has sent out a booklet which describes their portable tensile testing machine. While it does not indicate standards for materials or for specific welding applications, it does give the proper manner of making tensile strength tests and interpreting results. (144)

Pressure Indicator

A leaflet describing their pressure indicator, Maihak Type 2-CP, may be had from the Bacharach Industrial Instrument Company. This indicator is adaptable to any pressure range and is applicable for speeds up to 500 r.p.m. and may be used on Diesel engines, steam engines, compressors and pumps. (145)

Heat Enduring Materials

The Calorizing Company has prepared a booklet which tells about their process for rendering steel immune to oxidation and resistant to corrosion and which gives the properties of their series of Calite alloy steels. (146)

Welding Carbon Products

A leaflet from the National Carbon Company, Inc., gives the characteristics of the three standard grades of electrodes manufactured for use in electric arc welding and cutting processes, as well as the prices of the various sizes. (147)

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New Materials and Equipment

Hydrochloric Acid Resistant Alloy

The Duriron Company, Inc., Dayton, Ohio, announces the development of a new alloy that is almost entirely resistant to hydrochloric acid at all concentrations and all temperatures up to the boiling point. Hydrochloric acid, widely used commercially, is one of the most vicious acids for attacking metals. Heretofore, the only metals available for complete resistance have been very costly.

Durichlor (Dur-i-chlor), the name of the new alloy, is comparatively inexpensive and is being used to make pumps, valves, pipe, fittings, jets and other pieces of chemical handling equipment.

Metals & Alloys, June 1933.

New Steel Beer Barrel

A newly-developed steel beer barrel, retaining all the old traditions and offering important modern improvements is announced by the Murray Corporation of America, Detroit, Michigan.

The new Murray product looks like a wooden barrel, is adapted to standard equipment for cleaning, pitching and filling and stacks and rolls easily. It has standard bung and tap which are designed to make them ideal for sealing. The barrels will be delivered pitched ready for use. The inner surface of the container is made porous by a special process so that the pitch will adhere tightly to the steel surface.

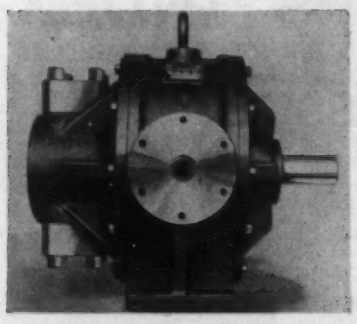
The Murray barrel has approximately half the weight of the ordinary wooden barrel. It is formed of rustproofed steel so as to insure long life and minimum maintenance costs. Bulged sides allow complete drainage. Smooth inside surfaces insure perfect cleanliness. The barrels are adapted for interstate commerce because they are capable of complete sterilization and pasteurization.

One of the most important features of the new Murray barrel is the insulation against heat and consequent deterioration of its contents, especially if the filled barrel is allowed to stand for some time in the sun. The barrel is formed of two sections. One is the inner container, which is built up by welding together two half sections. The other is a strong outer shell which is solid seam welded to the inner vessel so as to form air spaces at either end. These provide the insulation feature. Tests show that the barrels may be handled at once after pitching.

Two wide beads are formed around the adjacent rims of the outer shell to form raised runners on which the barrels may be rolled without possibility of damage to the inner container. These runners fit standard conveyor systems. The barrel also simulates the old wooden beer barrel by having deep chimes formed in the ends of the outer section. These permit easy gripping for handling.

Metals & Alloys, June 1933.

Pressure Pumps for Hydraulic Machines



For generating pressure in operating hydraulic powered machinery, such as presses, machine tools, welding machines, steel mill machinery, etc., the Hydraulic Press Mfg. Co., Mount Gilead, Ohio, announce a new series of radial pumps particularly suited for application to heavy duty production machines requiring high pressures. The new H-P-M Pump, of the positive displacement, multiple radial plunger, oil pressure type is said to embody a number of important inventions. The output is variable in volume and reversible in direction of flow, which characteristics, with the aid of H-P-M Pump Controls, make for economical transmission and application of hydraulic pressure. Among the advantages claimed are high efficiencies—both mechanical and hydraulic; smoothness of delivery; vibrationless operation; positive displacement throughout suction and delivery; simple design with a minimum of parts; complete automatic lubrication; and low maintenance. These H-P-M heavy duty radial pumps are built in 6 sizes, ranging from 1 to 100 g.p.m., with pressure capacities up to 3000 lbs./in.^{2}.

Metals & Alloys, June 1933.

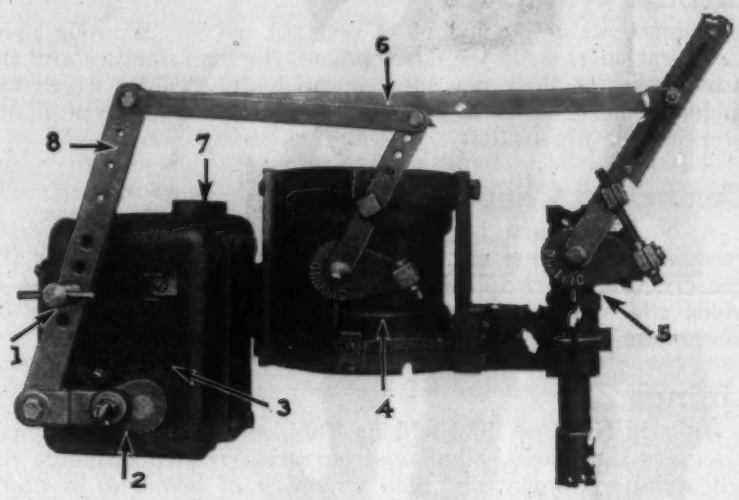
Improved Heating Material

A new series of "Nichrome" alloys, to be known as "Nichrome V" constitute the latest step in the development of nickel-chromium alloys by the Driver-Harris Co., Harrison, N. J. It is an outgrowth of 8 years' work in the direction of developing a long life alloy which would stand higher temperatures than the alloys which have been available. The steps in this process were first to have developed a standard life test method, which was worked out after the formation of Committee B-4 of the A.S.T.M. It was then possible to evaluate the results of changes in metallurgical process in terms of durability. "Nichrome V" is essentially the same alloy as Nichrome IV and carries approximately 20% chromium, balance nickel and other minor constituents. It also has approximately the same specific resistance and temperature coefficient of electrical resistivity and its physical properties are also of the same order as it is of Nichrome IV but it differs chiefly from the latter in its metallurgical processing, which has made it exceptionally clean and free from impurities.

Metals & Alloys, June 1933.

Power Unit for Control Systems

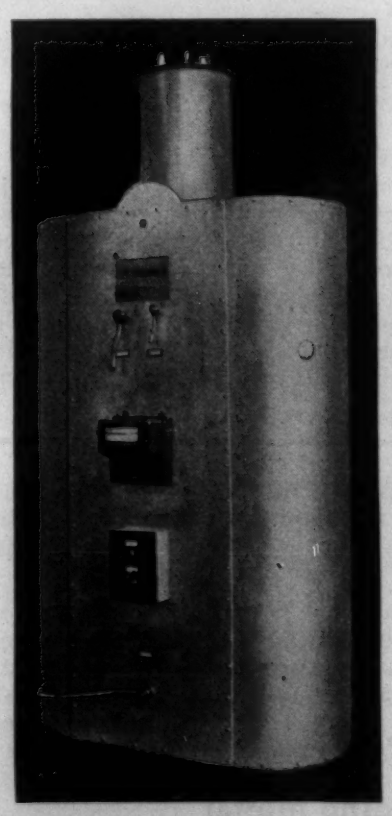
To meet the demand for a sturdy but inexpensive power unit of the 2-position type, the Automatic Temperature Control Co., Inc., Philadelphia, has added to its line "Type 2 Controller," which has sufficient power to operate an air valve up to 4" size in combination with a ½" fuel oil valve, or to operate 2 valves up to 4" size as a unit on low-pressure gas and air. Where furnace atmosphere is important, valves having similar characteristics are provided, each equipped with micrometer screw adjustment for minimum setting and with index and dial plate to permit readily duplicating previous settings. Maximum settings for both fuel and air valves can be obtained by adjusting the connecting links



(6) where attached to the valve levers, and where attached to the main operating lever (8). With the valves adjusted for desired combustion, the fuel-air ratio is maintained throughout the stroke. Both valves are moved simultaneously. The fulcrum stud (1) can quickly be removed, thus permitting the attendant to manually move the main operating lever (8) with attached valves to any desired position. This is a convenience when starting up a furnace, and obviates the expense of by-pass piping and valves for the air line.

Metals & Alloys, June 1933.

Gas Drying Apparatus



"LECTRODRYERS" are a standardized line of apparatus built by the Pittsburgh Lectrodryer Corp., Pittsburgh, Pa., devoted to their new "Activated Alumina System" for drying air and gases. To the metallurgist this apparatus is of special interest because it provides a clean, easily operated and inexpensive method of completely removing water vapor from gases used in controlled atmosphere annealing. The conditioning of warehouses to prevent the precipitation of moisture on steel in storage is another application. The apparatus is built in single units for batch or in dual units for a continuous operation. Sizes range upward from the laboratory unit of 100 cu. ft. per hour capacity. The "Activated Alumina" used drying agent does not have to be replenished. It does not deteriorate with use and may be repeatedly reactivated. Reactivation is conducted electrically by a special type of equipment developed for this purpose. It is not necessary to blow air through the apparatus when reactivating. This is a distinct advantage when drying expensive gases for it avoids the necessity of purging after reactivation. Fuel fired reactivation is also available. The apparatus is ruggedly built to meet mill requirements. All valves and electrical circuits for reactivation are interlocked and interconnected so that in the dual units the shifting of one lever is the only attention required to operate the apparatus.

Metals & Alloys, June 1933.

GENERAL (0)

A Modern Conception of Steel Quality. H. W. Graham. *Yearbook American Iron & Steel Institute,* 1932, pages 59-114; *Engineer,* Vol. 154, Aug. 19, 1932, pages 192-193; *Blast Furnace & Steel Plant,* Vol. 20, June 1932, pages 501-505; July 1932, pages 584-587. Object of this paper is to point out to both steel-maker and steel-user that present-day technical basis for sale or purchase of steel is not only irregular in degree of severity of requirement but often technically unsound. Variations of steel quality are inadequately explained by chemical analysis of common elements. Term "sensitivity" is suggested to refer to characteristics of steel by virtue of which it responds in varying degree to external conditions. Sensitivity is postulated to originate in a group of elements entrapped in solidification of liquid steel. Further source of varying sensitivity is suggested to lead in part back to blast-furnace production of pig-Fe. It is stated that degree of sensitivity is a function of a heat of steel as a unit, and that physical or thermal treatment below melting temperature is not expected to change fundamental rate of response. Mechanism by which a group of elements may produce variation in sensitivity is touched upon, and it is suggested that varying degree of solubility of these elements and associated colloidal phenomena are effective conditions. It is suggested that visible inclusions and metallographic form of C bearing compounds are of less importance than frequently supposed. 16 references. MS + LFM + VVK (0)

Control of Material. (Zweckmässige Werkstoffkontrolle.) E. Zingg. *Eidgenössische Materialprüfungsanstalt,* Zurich, Report No. 64, 1932, pages 32-40. Efficient testing and control of structural and tool steels is considered, with special reference to macroscopic and microscopic examination. Preparation of samples for mechanical tests, various factors affecting quenching properties and mechanical tests, particularly various types of hardness tests are dealt with. A large number of excellent micrographs is shown. GN (0)

Industrial Economies. B. Lester. *Electric Journal,* Vol. 29, Dec. 1932, pages 567-569, 572. Many examples of industrial rehabilitation with resulting economies are discussed. Production and improvements in strip steel manufacture are outlined. Tremendous possibilities for controlling processes and production operations, studying power consumption, securing maximum production from costly machines, lowering maintenance costs, and avoiding expensive breakdowns exist by use of electrical instruments. Photocells and electronic tubes also offer many possibilities for further economies. CBJ (0)

Standards. Report of A.S.T.M. Committee E-10, T. R. Lawson, Chairman. *Preprint* No. 8, June 1932, *American Society for Testing Materials.* 7 pages. Review of A.S.T.M. standardization activities, consideration of new and revised tentative standards, relations with American Standards Association, and promotion and expansion of standardization activities. VVK (0)

Osmiridium in Tasmania. P. Ormsby Lennon. *Sands, Clays & Minerals,* Vol. 1, Sept. 1932, pages 5-11. Osmiridium as found consists of Ir and Os with small percentages of Rh, Ru and Pd. Hardness is 6-7, sp.gr. from 19.3 to nearly 22. Found in free or alluvial state in very irregular distribution. Recovered in a manner similar to Au by washing and panning-off. Used commercially almost exclusively for manufacture of fountain pen nibs; process is described. Price for an ounce in the field was £32 15s in 1926. Ha (0)

Selecting Steel as a Raw Material. W. A. Howard. *Colorado Engineer,* Vol. 28, Mar. 1932, pages 62-63, page 75. Discusses connections between quenching temperature, micro-structure and Brinell Hardness Number of medium C steel (S.A.E. 3140) and a Cr-Ni steel (S.A.E. 1040). EF (0)

Salability and the Shop. John Haydock. *American Machinist,* Vol. 77, Jan. 18, 1933, pages 32c-32d. Interdependency between shop executives and designing engineers is pointed out and importance of proper design from point of view of modern manufacturing methods emphasized. Examples of advantageous use of welding, determination of permissible tolerances, etc. are given. Ha (0)

PROPERTIES OF METALS (1)

Aluminum and its Alloys. N. F. Budgen. Isaac Pitman & Sons, New York, 1933. Cloth, 5½ x 8½ inches, 278 pages. Price $4.50. The preface states that there are excellent books covering the subject in detail, so that there is no need for another of that nature. His object "is to provide for the less technical reader a handbook intentionally treating of the whole subject in a relatively popular manner and without going into too great detail." It "is not intended either for the specialist or for the advanced student."

If one wants such a book, when other more complete treatises are available, this is accurate and up-to-date, as far as it goes. The inclusion of micrographs, equilibrium diagrams and other material of that nature without discussion of their meaning from the point of view of general metallurgy, indicates that the reader is supposed to have a metallurgical foundation. It is not a book for the non-metallurgical reader. It must be aimed at upper classmen in college metallurgical courses. It would be rather unsatisfactory for their use in after life because of the almost total absence of references by which the student could go more deeply into the many important details so briefly sketched here.

The reader will get a general idea of the ores of aluminum, the production of Al_2O_3, of the production of the metal, of the properties of commercial aluminum and its cast, wrought, and heat-treated alloys and of their processes of manufacture, together with a general picture of their uses.

It is written from the British viewpoint, copiously illustrated with photos of British plants and products. The book would put the student in shape to utilize more detailed information, but will be of little interest to those already working with aluminum, or to those already possessing Edwards, Frary and Jeffries' more complete treatise. H. W. Gillett (1)-B-

Electron Theory of Metals. (Elektronentheorie der Metalle.) From Band XI, Ergebnisse der exakten Naturwissenschaften. R. Peierls. Julius Springer, Berlin, 1932. Paper, 6¼ x 9¼ inches, pages 265-322. Price of whole volume (442 pages) 36.50 RM. This chapter of one of the large German "Handbooks," is, like most of its kind, complete in itself and an excellent exposition of the subject by a well-known authority.

The subject is the mathematical physics of the free or conducting electrons in metals. These electrons, first postulated by H. A. Lorentz, have in the hands of the workers in quantum mechanics since 1926, been found to rather completely account for the thermal, electrical, optical, and magnetic properties of metals. It is these theories which the Peierls monograph assembles and discusses. Particular subjects include the Richardson effect, specific heats, thermoelectric effect, Hall effect, photoelectric effect, and electrical resistance including superconductivity. The foundation of the work is the Fermi quantum-mechanical statistics, of which a brief treatment is given.

The omission of the names of Dirac, Einstein, and other modern workers of great importance may be excused on the grounds of the necessary brevity of the work. A praiseworthy feature is the generous use of graphic explanatory diagrams. R. H. Canfield (1)-B-

PROPERTIES OF NON-FERROUS ALLOYS (2)

Platinum Alloys in the Chemical Industries. Edmund R. Thews. *Chemical Age,* London, Vol. 26, June 4, 1932, pages 34-35. The Pt group of metals, Pt, Ir, Os, Pd, Rh, Ru, are now extensively used industrially. Their chemical and physical properties are given very much in detail, particularly the Pt-Ir, Pt-Pd and Pt-Rh alloys. See also *Metals & Alloys,* Vol. 1, Dec. 1930, page 898. VVK (2)

Cast Metals and Alloys. Elements of the Science of the Production and of the Properties of Castings. (Gegossene Metalle und Legierungen. Grundlagen der Metallgiessereitechnischen Werkstoffkunde.) W. Claus & A. H. F. Goederitz. M. Krayn, Berlin, 1933. Cloth, 8½x12 inches, 346 pages. Price 68 RM. This book is an outgrowth of a series of wall charts and tables, now augmented by additional material and a parallel text. This book is one of several sponsored by the Vereins Deutscher Giesserei-Fachleute in an endeavor to organize an adequate literature around foundry art and science. The scheme of the book presents a brief text outlining the scientific aspects of casting alloys and casting problems in the non-ferrous field, fortified by tables and diagrams in minute description of the technical aspects of the casting industry. The first section deals with theoretical and applied metallurgy, including a brief description of the solution of gases by molten metals and alloys and of remedies for gas absorption, the course of freezing and grain structure, and shrinkage and piping. To this brief text is appended a series of wall charts and tables in more particular treatment. Here we find a well-considered treatment of the structure, and of physical and mechanical properties of the important commercial alloys in dependence upon constitution and casting technique with discussion of segregation (normal and inverse). Following there is a section on heavy metals and heavy metal alloys, including Cu, brasses, bronzes (including 21 special bronzes), German silver, Ni and Ni alloys, Co alloys, Ag alloys, Au alloys, Pt alloys, Zn and Sn alloys, Pb and Pb alloys, Bi and Bi alloys; and then a section on light metals and alloys, including Al and Al alloys, Mg and Mg alloys. Thereafter follows a brief discussion of foundry practice: casting technique, furnaces, refractories, crucibles, fuels, pyrometry, and mold materials. This part of the book presents constitutional diagrams of the systems represented by industrial alloys, together with those representative of the common impurities (Cu-O, Cu-S in connection with Cu alloys), a discussion of deoxidizers, protective fluxes, effect of impurities upon microstructure. Typical structures are throughout illustrated by photomicro- and macrographs. The second part of the book is composed entirely of tables and charts and is essentially a repetition of the first (without accompanying text) in considerably more detail, especially with respect to the properties (mechanical, physical, and electrical) of commercial castings. Thus under the discussion of Cu,—which may be taken as typical of the treatment given the other metals and alloys—we find the following subjects discussed and pertinent data given: commercial grades, melting and freezing points, specific heat, heat of fusion, density, thermal expansion, contraction on freezing, electrical and thermal conductivity, color, magnetic and optical properties, elastic moduli, gas solubility, atomic weight, chemical properties and resistance, mechanical properties (chiefly as pertaining to the cast state, but also to the worked and annealed state for comparison); foundry technique, crucibles, furnaces; effect of foreign elements on Cu (sixteen of these); literature. The third section of the second part deals with foundry practice and is again a more detailed treatment in the form of tables of the preceding section. The authors have assembled into this book a useful compendium of information, scientific and technical, upon castings and casting problems. This information is always pertinent, sometimes surprising in its scope and completeness. It is the most complete book now available on this subject. Perhaps it is inevitable that the first effort in assembling a book in a given field should not please everyone. This book appears to the reviewer to suffer badly from faulty organization, the scheme used requiring a double treatment, as stated above. The earlier incarnation of the material in the form of wall charts is too evident in the present book form, for the earlier form is too little fused into the new form. The type and page form is at first a shock, for the type, even in the text, is display type, and the diagrams are often so bold as to be almost blinding. If the book were revised, particularly with an eye to simpler organization of the material, it would prove more useful than it will with its present puzzling scheme of organization. The extremely high price of the book will doubtless handicap its distribution. R. F. Mehl (2)-B-

Some Non-Ferrous Engineering Alloys. Wesley Lambert. *Transactions Institute Engineers & Shipbuilders Scotland,* Vol. 74, 1931, pages 172-191; discussion, pages 191-202. For abstract of paper see *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 262. In the discussion reference was made to the injurious effect of hammering white-metal bearings, and to the tinning of cast-iron bearing shells preparatory to lining with antifriction metal. The cost of Pb-base and Sn-base white metals in relation to their specific gravities was also referred to, and the use of Si-bronzes, of "Al-bronze" condenser tubes and the manufacture of pressure-castings was considered. The following metals and alloys are discussed and their principal applications and compositions described: brasses, Mn bronze, Al bronze, gun metal, phosphor bronze, Pb bronzes, which are composed of Cu, Sn and Pb, the first predominating, Monel metal, anti-friction white metals, for which a few compositions are given. Ha (2)

Bearing Bronzes with Additions of Zinc, Phosphorus, Nickel and Antimony. E. M. Staples, R. L. Dowdell & C. E. Eggenschwiler. *S. A. E. Transactions,* Vol. 25, 1930, pages 85-92, 248. See *Metals & Alloys,* Vol. 1, Nov. 1930, page 842. (2)

Platinum-Iridium Alloys. (Die Platin-Iridium Legierungen.) R. Thews. *Die Metallbörse,* Vol. 20, Jan. 16, 1932, page 66. The various factors exerting a paramount influence upon the price of Pt-alloys are reviewed and the great strength and permanently bright metallic luster of the Pt-alloys are stressed. For wires and screens, 25% Ir is generally added while most standard Pt-Ir alloys run up to only 10% Ir. How Ir induces hardness in Pt-Ir alloys is shown by the following table:

% Ir:	5	10	15	20	25	30	35
Tensile strength in kg:	40	49	66	82	99	114	127

Above 40% Ir the hardness of Pt-Ir alloys decreases. The strength in hard drawn 90/10 Pt-Ir wires gains on annealing as is the case with Pt-Ag alloys. Alloys with 15-25% Ir are heat-treated at about 600° C. Pt-Ir alloys are not very stable at elevated temperatures. No oxides are formed only in case of Pt-Rh alloys, while Os, Ru, Pd and Ir are apt to form oxides which are mostly volatile. The critical temperature for Pt-Ir alloys with 25-35% Ir is about 1000°-1100° C. Ir greatly improves the chemical resistance of Pt. A 70/30 Pt-Ir alloy is insoluble in hot concentrated aqua regia. The attack of boiling concentration H_2SO_4 is also reduced materially. EF (2)

Lead-Tin Bronzes, Their Constitution, and Their Suitability and Use for Highly Stressed Bearing Metals. (Über Blei-Zinnbronzen, ihre Konstitution, ihre Eignung und Verwendung als hochbeanspruchte Lagermetalle.) B. Blumenthal. *Metallwirtschaft,* Vol. 11, June 24, 1932, pages 360-362; July 1, 1932, pages 374-375. 12 references. The constitution and miscibility in the liquid state of Cu-Sn-Pb as reported by several investigators are discussed. Alloys containing as much Pb as to be immiscible in the liquid state have not been used commercially, but could be made by cooling sufficiently rapidly that the Pb would be distributed in small particles. It is difficult to make practical tests on bearing metals and their suitability is usually determined by laboratory tests such as hardness, tensile and impact strength, endurance limit and wearing tests, at ordinary and elevated temperatures. The addition of Sn improves the mechanical and bearing properties, while Pb improves the bearing properties. The best and most used alloys contain 4 to 7% Sn and 15 to 25% Pb. These alloys have been used extensively for bearing on locomotives and rolling mills where the stresses are high and temperatures are apt to be high also. CEM (2)

Electrical Properties of Diluted Solid Solution Alloys. II. Resistance of Silver Alloys. (Elektrische Eigenschaften verdünnter Mischkristallegierungen. II. Widerstand von Silberlegierungen.) J. O. Linde. *Annalen der Physik,* Series 5, Vol. 14, Aug. 1932, pages 353-366. The increase in the atomic resistance of Cu, Zn, Ga, Ge, As, Pd, Cd, In, Sn, Sb, Pt, Au, Hg, Tl, Pb and Bi in Ag was determined. The increase changes approximately linearly with the square of the horizontal distance of the alloyed metal from the basic metal in the periodic system. Ha (2)

PROPERTIES OF FERROUS ALLOYS (3)

Martensitic Cast Iron (Ueber martensitisches Gusseisen). M. Waehlert & R. Hanel. *Die Giesserei*, Vol. 19, Nov. 11, 1932, pages 458-464. Hard cast-Fe with good machinability can be produced only by a gray Fe which has been refined or alloyed to give it greater hardness. Influence of formation of martensite on hardness and that of alloying constituents Si, Mn, Ni and Cr on hardenability is discussed and tables and curves show the characteristics of hardness, penetration into Fe from surface and temperatures of hardening. Si is worst, Ni best, alloying addition. Mn and Cr alone can not be used, only in small amounts as addition to Ni. Fields for employing martensitic cast-Fe are described and directions for proper selection of chemical composition and heat treatment are given. Ha (3)

Iron-Chromium, Iron-Chromium-Nickel and Related Alloys. Report of Committee A-10, Jerome Strauss, Chairman. *American Society for Testing Materials, Preprint* No. 17, June 1932, 2 pages. Progress reports of subcommittees. VVK (3)

Technical Materials of Great Magnetic Softness. (Technische Werkstoffe grosser magnetischer Weichheit.) F. Stäblein. *Zeitschrift für technische Physik*, Vol. 13, No. 11, 1932, pages 532-534. A few magnetic materials are discussed, such as pure Fe, Fe-Ni alloys, silicated Fe, which possess an extremely small coercive power and find therefore wide use in construction of instruments; coercive force values are below 0.3 Oersted and can even be lower. At the same time, Fe-Ni steel with 36% Ni possesses a very small heat expansion. A method for measurement of such small coercive forces is described, and magnetization curves of various materials are given. 4 references. Ha (3)

Nickel and Chromium in Cast Iron. Their Effect on the Properties. (Nickel und Chrom im Gusseisen, deren Wirkung auf die Eigenschaften desselben.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 27, 1932, pages 471-472; Dec. 11, 1932, pages 493-494; Dec. 25, 1932, pages 509-510. Discusses (a) effect of Si, Ni and Cr on corrosion properties, (b) effect of these elements on density and (c) on tensile properties of cast Fe. As to (a) investigations by Kötzschke & Piwowarsky and Piwowarsky & Freytag are especially referred to, showing that cast Fe with 1.12% Cr has a high resistivity to HCl. Since hardness increases with increasing Cr content use of higher Cr contents depends on application. Effect of alkaline solutions is discussed at length. With Ni-alloyed cast Fe attack of NH_3 compounds is stronger than that of Na and K solutions. (c) Tensile properties essentially depend on amount and type of C present. Extensive data on effect of Ni and Cr on tensile strength and elongation are tabulated. Cr increases hardness and tensile strength more than does Ni, but highest values of elongation are attained at higher Ni contents. It is shown that cast Fe that can be improved by other methods than alloying can be still further improved by adding Ni and Cr. Advantages and application of Ni-Cr cast Fe are dealt with, as for castings of thin wall thickness, castings of high resistance to wear, and growing, castings to be used in the chemical industry, and many other purposes. Various types of Ni-Cr pig irons are finally considered. GN (3)

Toncan Wire and Metal. *Wire & Wire Products*, Vol. 8, Feb. 1933, pages 59-62. Toncan is a rust-resisting basic open-hearth ingot Fe with 0.4 to 0.42% Cu, 0.02% C, 0.14% Mn, 0.035% S, 0.005% P, 0.005% Si and about 0.70% Mo. Specific gravity is 7.88, electric conductivity 12½% of that of Cu, heat conductivity about same as steel, coefficient of expansion 0.00000674, melting point 1524° C. (2770° F.). It must be carefully heat-treated, always between 1150° and 1200° F., to remove effects of cold-working, with a final anneal at 1650° F. followed by air cooling to develop fine grain. Due to its very low C content it can never be hardened. It can find use in all cases where soft steel is suitable, except for castings. Ha (3)

Inherent Properties of Cast Iron. *Foundry Trade Journal*, Vol. 47, Aug. 18, 1932, page 98. Reference is made to the work of B. F. Shepherd on "personality" (body or timbre) in tool steel, and the suggestion is put forward that some consideration might be given to this somewhat intangible characteristic in cast Fe. OWE (3)

High Strength Cast Iron. (Fonte résistante.) *La Fonte*, Apr. 1932, pages 137-138. Fe castings which have to resist 85,000 lbs./in.^{2} crushing pressure. Composition: Total C 3.0-3.2%, Si 1.6%, Mn 0.6-0.8%, P less than 0.3%, S less than 0.10%. Composition of charges: Foundry returns (heads and sprues) 20%, hematite pig Fe of fine grain 55%, manganese hematite pig Fe 20%, steel scraps 10%. FR (3)

Specifications for Gray Iron. *Foundry*, Vol. 60, Sept. 1932, pages 32-33, 62. Specifications adopted for gray Fe castings not covered by other specifications of American Society for Testing Materials apply to gray Fe castings in respect to strength. Castings are listed according to minimum tensile strength of test bars. VSP (3)

Steel. Report of Committee A-1, J. B. Young, Chairman. *Preprint* No. 9, June 1932 meeting, *American Society for Testing Materials*, 52 pages. Proposed tentative specifications and revisions of specifications on all product steels. VVK (3)

Copper-Molybdenum Steel. (L'Acier au Cuivre-Molybdène.) *Cuivre et Laiton*, Vol. 5, Oct. 30, 1932, pages 479-481. This steel presents a particularly high resistance to corrosion; its composition is 0.04-0.05% C, 0.25-0.35% Cu, and about 0.05-0.07% Mo, 0.45% Mn, 0.013% S, 0.014% P, 0.01% Si. Mo forms a solid solution with ferrite which cannot be discovered in micrographs, and gives to steel a very fine and homogeneous grain structure. Steel is poor in segregation and shows macrographically a remarkable purity. It can easily and effectively be welded with electric arc as well as with gas. Addition of Mo to Cu steel increases corrosion resistance, gives a greater ductility and greater reduction of area and increases impact resistance; resistance to oxidation at elevated temperatures is improved and ratio of tensile strength to elastic limit increased. Test results are given in detail. Ha (3)

The Weldability of Copper Steel. (La Soudabilité de l'Acier au Cuivre.) *Cuivre et Laiton*, Vol. 5, Oct. 30, 1932, pages 465-471. Many tests made with steels containing 0.17-1.96% Cu are reproduced in tables and diagrams. Welded pieces were compared with mechanical properties of not-welded sheets of same composition. In spot-welding weld of a steel with 0.4% Cu attains about 95-98% of tensile strength of metal itself, with electric arc about 75%; elastic limit is even higher. With welding torch and a pencil of 0.6% Cu (sheet had 0.3%) following values were obtained: Full metal 40.4 kg./mm.^{2} ultimate strength, 32.4 kg./mm.^{2} elastic limit, 25.8% elongation; Weld metal 40.2 kg./mm.^{2} ultimate strength, 28.8 kg./mm.^{2} elastic limit, 25.7% elongation. In general tests show that mechanical properties of steels with 0.3-0.4% Cu which give former a very good corrosion resistance are not modified in any appreciable way. Ha (3)

Electrical Properties of Nickel-Iron Alloys over a Wide Range of Temperatures. (Propriétés électriques des alliages de fer et de nickel dans un large intervalle de températures.) Pierre Chevenard. *Revue du Nickel*, Vol. 3, Apr. 1932, pages 55-64. A compilation of an exhaustive amount of experimental data shown in a series of curves with description and discussion of the electrical resistivity, temperature coefficient of resistivity and thermal e.m.f. of Ni-Fe alloys of varying composition. These electrical properties obey the laws of solid solutions as well to the α as for the γ alloys. Addition of Ni to Fe or of Fe to Ni increases resistivity, decreases the thermal coefficient of resistivity and modifies the thermal e.m.f. In the range of the reversible ferromagnetic austenites the conclusions drawn from the electrical resistivity studies are in complete agreement with the experimental data of thermal e.m.f. and dilatometric studies. No conclusion can be drawn as to the existence of the compound Fe_2Ni. AH (3)

Malleable Iron Castings. Report of A.S.T.M. Committee A-7, W. P. Putnam, Chairman. *Preprint* No. 15, June 1932, *American Society for Testing Materials*, 6 pages. Proposed Tentative Specifications for Malleable Iron Castings. Progress report on committee activities. VVK (3)

New Materials in American Steam Technique. (Neuere Werkstoffe in der amerikanischen Dampftechnik.) Dagobert W. Rudorff. *Archiv für Wärmewirtschaft und Dampfkesselwesen*, Vol. 13, Dec. 1932, pages 332-333. Reviews composition and physical properties of a large number of steels as they are used at present in American steam power plants for boiler sheets, tubes, bolts, high pressure turbines, etc. GN (3)

Some Thermomagnetic Effects in Nickel and Iron. Shih-Chent'ao & Wm. Band. *Proceedings Physical Society*, London, Vol. 44, Mar. 1, 1932, pages 166-170. Simultaneous application of a longitudinal magnetizing field and a temperature gradient in Ni and Fe wires produces an e.m.f. which was measured for various fields and temperatures. Ha (3)

Available Composition Range for High Elastic Steel Plate as Rolled. Itsuji Adachi & Shunichiro Nagai. *Seitetsu Kenkyu*, Sept. 1932, pages 102-108. By adding small amount of Mn to mild steel, tensile strength and elastic limit are markedly raised without decreasing toughness. Authors carried out tensile test in rolled condition with 587 steels containing 0.2-0.36% C and 1.0-1.7% Mn, and determined available composition range for high elastic steel plate with over 18 tons/in.^{2} elastic limit, over 25 tons/in.^{2} yield point, 38-42 tons/in.^{2} tensile strength and over 20% elongation in 8″ gage length as follows: if C = 0.24%, Mn = 1.25-1.65%; if C = 0.26%, Mn = 1.18-1.55 %; if C = 0.28%, Mn = 1.16-1.43%; if C = 0.30%, Mn = 1.03-1.35%; if C = 0.32%, Mn = 1.00-1.28%. TM (3)

Martensitic Cast Iron. (Über martensitisches Gusseisen.) R. Hanel. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 11, 1932, page 495. Requirements of high hardness, high resistance to wear in combination with easy machinability can be met by described martensitic cast Fe, which is made by alloying gray Fe with Si, Mn, Ni, Cr. Ni is of greatest importance. Effect of chemical composition, hardening temperature, cooling velocity, drawing temperature on Brinell hardness, tensile strength, transverse strength, compressive and shear strength, resistance to wear and machinability are discussed. Rules are developed for proper selection of Ni content. Applications are enumerated. Higher costs through heat treatment are compensated by longer durability. Martensitic cast Fe seems to solve problem of producing a wear resistant cast Fe. GN (3)

Contribution to the Study of Heredity in Cast Irons. (Contribution à l'Etude de l'Hérédité des Fontes.) E. Buffet & H. Thyssen. *La Fonderie Belge*, Vol. 2, Mar. 1932, pages 40-44. See *Metals & Alloys*, Vol. 3, June 1932, page MA 160. FR (3)

Ferro-Alloys. Report of A.S.T.M. Committee A-9, N. B. Hoffman, Chairman. *Preprint* No. 16, June 1932, *American Society for Testing Materials*, 16 pages. Includes proposed tentative specifications for ferro-W, low-C ferro-Mo, Mo salts and compounds and proposed tentative methods of chemical analysis of ferro-W and ferro-Mo. VVK (3)

Spring Steels. (Federstähle.) Eduard Houdremont & Hubert Bennek. *Stahl und Eisen*, Vol. 52, July 7, 1932, pages 653-662. The composition of ordinary spring steels, their manufacture, and behavior during shaping under heat are discussed both for uses in railroad work and elsewhere. Certain specifications are given for supply of leaf spring steel and leaf springs in Germany. Vibration strength of these steels, with respect to its relation to particular alloys and condition of surface of material, was discussed in light of test results made in past. Type of alloy is without effect on vibration resistance of spring-hardened steels. For railroad and automobile spring material, however, it is important to note decrease of vibration strength as a result of either notch effect of a black rolled surface, change in condition of surface in process of heat treatment, or corrosion during use of the material. DTR (3)

The Manufacture and Heat Treatment of Sheet and Strip Steels. E. F. Davis. *Fuels & Furnaces*, Vol. 10, July-Aug. 1932, pages 465-470. Grading of sheet steel, automobile body sheet, Sn plate, taggers Sn, terne plate and galvanized plate, trade designations of various grades and specifications are described. Ha (3)

Wrought Iron. Report of A.S.T.M. Committee A-2, H. W. Faus, Chairman. *Preprint* No. 10, June 1932, *American Society for Testing Materials*, 3 pages. Revisions of specifications. Progress reports of subcommittees. VVK (3)

Magnetic Saturation. (Ueber magnetische Sättigung.) E. Czerlinsky. *Annalen der Physik*, Series 5, Vol. 13, Apr. 1932, pages 80-100. Study of laws according to which ferro-magnetic substances approach their point of saturation in strong fields. Tests show that in very strong fields a diamagnetic susceptibility is superposed on the ferromagnetism which produces a deflection in opposite direction of the galvanometer used for measurement. Curves are reproduced. 16 references. Ha (3)

Contribution to Study of Cast Iron of Low-Carbon Content. (Contribution à l'etude des fontes à basse teneur en carbone.) Georges Delbart & Edgar Lecoeuvre. *Comptes Rendus*, Vol. 195, Aug. 1, 1932, pages 386-388. Gray, pearlitic cast irons, having a C content less than 2.80%, are generally cast at temperatures much in excess of those at which irons containing from 3 to 4% of total C are cast. These low-C irons have high mechanical properties but are difficult to deal with in foundry. Authors have studied a series of irons in which C content varied from 1.7 to 2.5%. These irons contained relatively high proportions of Si (2.5-3.75%) and of Mn (1.4-3.75%). In certain cases small proportions of Cr were added. Si, Mn and P were introduced (1) to increase castability, (2) to counteract the effect of Si by means of Mn, (3) to conserve structural homogeneity and high mechanical properties, and (4) to increase the quenching characteristics. Irons having from 2.9 to 3.4% C and from 2 to 3% C and from 2 to 3% Si, after heating to 925° C. and cooling in still air, show on the Chevenard dilatometer a doubling of the Ar point, when the Mn content is increased beyond 1.5%. If the Mn content is increased beyond 2%, the Ar point appears alone at temperatures of from 150° to 200° C., and the Fe has a martensitic structure. Test samples of high C content possess generally mediocre mechanical properties, a coarse structure, and marked structural heterogeneity. In irons of low-C content Mn favors the formation of martensite and results in the production of irons having very interesting characteristics. In a table authors show the physical properties of 9 mixtures and in another table give mechanical properties of material containing 1.8-2.4% C, 1.5-2.5% Mn and 2.3-3.0% Si, subsequent to quenching and subsequent to a variety of drawing treatments. OWE (3)

Essex Slashes Camshaft Costs with Electric Furnace Alloy. Joseph Geschelin. *Automotive Industries*, Vol. 67, Nov. 12, 1932, pages 620-622. Many economies in production and life are afforded by use of new electric furnace alloy iron "Proferall." "X" grade used in automobile camshaft production has following chemical composition and physical properties: 2.20-2.35% Si, 0.10% S (max.), 0.20% P (max.), 0.50-0.65% Mn, 0.55-1.00% combined C, 3.15% total C, 0.40-0.50% Ni, 0.80-1.00% Cr, 0.40-0.50% Mo; tensile strength (min.) 50,000 lbs./in.^{2}; torsional strength (4° twist) 25,000 lbs./in.^{2}; transverse test (12″ specimen) 6,000 lbs./in.^{2} with deflection 0.23″; fatigue resistance 4 to 5 times that of SAE 1020; ultimate compression 153,000 lbs./in.^{2}; specific gravity about 7% less than that of steel; Brinell hardness (unchilled) about 300. In addition, wear tests, made both in laboratory and on road, range from 50,000 to 122,000 miles at high speeds. A maximum wear of less than 0.0003″ has been shown. Steel shafts in equal mileage tests and under equal conditions showed an average wear of 0.001″ to 0.0015″. In production of camshafts this new alloy Fe permits entire job to be a matter of rough and finish-grinding cams, eccentric and bearings. DTR (3)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION (4)

Alloy "Indicators" Suggested for Solving Corrosion Problems. T. HOLLAND NELSON. *Iron Age,* Vol. 130, Sept. 1, 1932, pages 331, 361. Suggests alloy indicators which are carefully selected combinations of alloys so arranged that after being submitted to any particular corrosion problems for a definite time, they will indicate most desirable group of alloys for solving the problem. Basis for indicators are following groups: (1) Fe-Cr group; (2) Fe-Cr-Ni group; (3) Fe-Ni group; and (4) Fe-Ni-Cr group. Describes method of using indicators. Indicator method will prove capable of: (1) Eliminating unnecessary experimental work; (2) Clearly defining element which imparts corrosion resistant properties to Fe base; (3) Giving a definite answer in regard to complex solutions without knowing details of their composition; and (4) Arriving at a desirable amount of single element or proper ratio between elements producing maximum resistance. VSP (4)

Oxidizability of Zn. I. The influence of Ni on the Oxidation of Zn. (Ossidabilita dello zinco.- Nota I. Influenza del nichel sull'ossidazione dello zinco.) A. OLIVERIO & O. BELFIORI. *Annali di chimica applicata,* Vol. 22, June 1932, pages 484-493. Pure Zn does not dissolve in water, but with even small amounts of Ni, it dissolves slowly in cold, and rapidly in hot water. It is proposed to utilize Zn-Ni couple in organic reductions, using neutral solutions. AWC (4)

Methods of Determining Effects of Corrosion. Correspondence from ALBERT PORTEVIN. *Metal Progress,* Vol. 22, July 1932, pages 57-58. Recommends that physical tests be used to supplement "loss of weight corrosion test" since this form of testing does not detect localized and subsurface corrosion and specific brittleness frequently imparted by activity of corrosive agencies. WLC (4)

Steels Resistant to Chemical Corrosion. (Les aciers resistant a l'attaque chimique.) A. PORTEVIN. *Revue du Nickel,* Vol. 3, July 1932, pages 75-90. Review of present knowledge of stainless steels. AH (4)

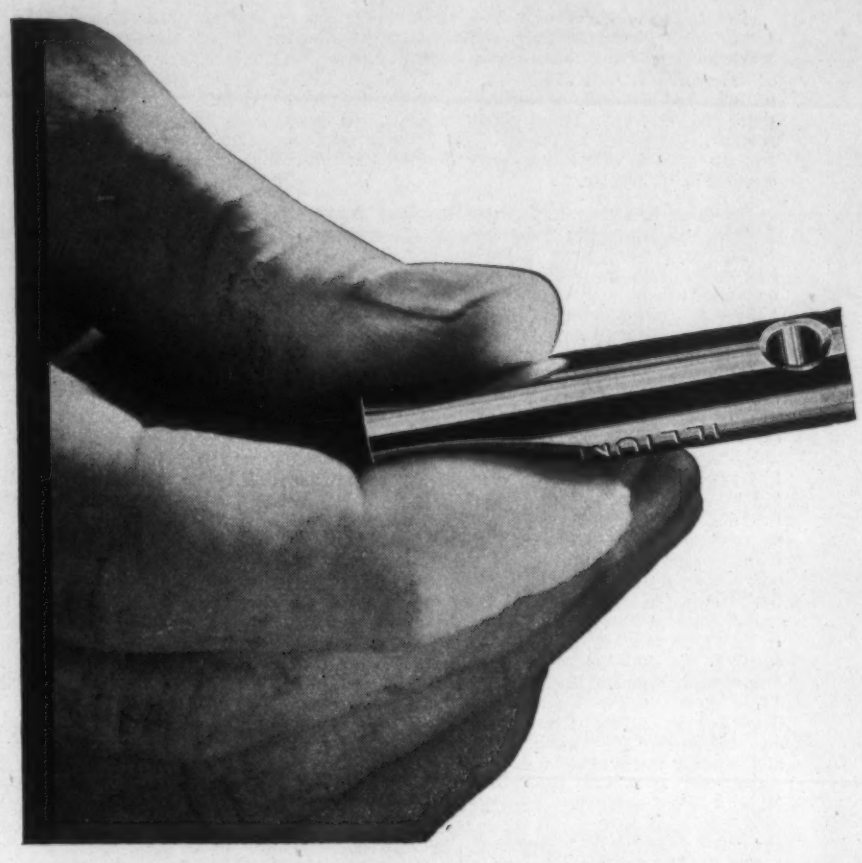
Experimental Studies of the Corrosion of Metals. (Etudes expérimentales sur la Corrosion des Métaux.) MARCEL PROT & N. GOLDWOSKI. *Genie Civil,* Vol. 100, Jan. 9, 1932, pages 35-38. Owing to many factors which may affect rate of corrosion of a metal, it is difficult to assign a definite "corrosion index" with extreme accuracy. Authors have developed a method which they claim does give a more precise value to corrosion index of any metal. They take for their corrosion index loss in weight of metal under certain specified conditions. Of these chemical composition, physical condition, and character of metal surface are important and should be reproducible. First 2 conditions offer no particular difficulties, but it is not easy to reproduce same surface condition of test-pieces; they adopt a chemical method of preparing necessary reproducible surface conditions. As regards corroding medium, it is important to know its chemical composition and amount of dissolved gas, such as O, which it contains. Initial pH value may also have an important role in rate of corrosion. An important factor is ratio of volume of corroding medium to metal. Amount of medium used in test should be very large, a fact which is often ignored. Method adopted here consists of allowing a slow stream of corroding liquid to flow through a vessel in which test-pieces are placed. Liquid, after passing over metal, is filtered and any precipitate obtained is added to loss in weight which metal undergoes after a specified time. A number of results are given which indicate degree of accuracy to which results may be reproduced. Ha (4)

Study of the Corrosion of Metals. TADEUSZ KUCZYNSKI & MICHAL SMIALOWSKI. *Przemysl Chemiczny,* Vol. 15, Feb. 1931, pages 52-61; Mar. 1931, pages 99-104. (In Polish). Discuss electrochemical theories of corrosion of metals. Attention is given to accelerated methods especially to method of Duffek and of Tödt. Saturated solutions of NaCl and KCl served as corroding media. Instead of Hg, Pt wire was used in Duffek's apparatus. No essential relation between shape of curves and loss of weight of investigated metals was found. Same is to be said of Tödt's method, which was used with an auxiliary electrode, although it presents theoretically very interesting results. Results indicated that flow of O to cathode is perhaps most important but not only factor influencing rate of corrosion of metals. As other factor is to be noticed catalytic ability of cathodic areas to activate O in an electromotive manner. This catalytic property was smaller for polished Pt than for other metals. Small differences in surface preparation of metals caused notable deviations in intensity of current. With Sn-Fe, and Pb-Fe couples an inversion of current was shown after some period of testing. Intensity of current in electrolyte was independent of presence of small quantity of quinoline, brucine, manitol, and sodium arsenate, but even a small quantity of KCN added to solution caused a perceptible diminution of current. KCN acted probably as a negative catalyst diminishing active area of cathode. Processes supplying current in present investigations were dissolution of anodic metal, and formation of chemical compound between H and O discharging on cathode. Last reaction goes much slower, and can be accelerated by an addition of a depolarisator. Fact that deviation of current intensity from Ohm's law decreases as current increases, indicates that there is no chemical polarisation on anode, and that this deviation is caused by surface-coating resistance on anode during dissolution of metal. Resistance of surface-coating layer depends on current intensity and diminishes with increasing current rate. ZJ (4)

The Effect of Oxygen Pressure on Corrosion of Steel. A. R. LEE. *Transactions Faraday Society,* Vol. 28, Sept. 1932, pages 707-715. Data are given for the corrosion of 1" disks of Fe with 0.13% C, supported horizontally in 100 cc. of N/10 KCl at 25° C. under O_2 pressures up to 25 atm. and for periods up to 10 days or more. The loss in weight was determined as well as the % of ferrous ion in the corrosion products which were loosened from specimens by boric acid treatment. Corrosion time curves for 1-20 atm. pressure are straight lines but above 20 atm. corrosion diminishes with time. The corrosion rate increases with increase of O_2 pressure. From 1-5 atm. the increase is greater than the corresponding pressure increase; from 5-20 atm. the corrosion rate is proportional to the pressure; above 20 atm. it appears to tend to a constant limiting value. There is no evidence of passivity produced by O_2 at high pressures. It is suggested that O_2 pressures up to but not over 20 atm. be used for an accelerated corrosion test, 10 days at 20 atm. being equivalent to 300 days at 1 atm. or 4 years in air. PRK (4)

The Effect of Oxygen Pressure on the Corrosion of Steel. U. R. EVANS & V. W. BORGMAN. *Transactions Faraday Society,* Vol. 28, Nov. 1932, pages 813-814. Discussion of "Effect of Oxygen Pressure on the Corrosion of Steel," *Transactions Faraday Society,* Vol. 28, Sept. 1932, pages 707-715. Chlorides interfere with inhibition of corrosion even by powerful inhibitors yet in their presence, O produces a reduction in the area suffering corrosion, if favorable conditions are maintained. This is explained by fact that, since cathodic reaction requires O, cathodic product, KOH, is present in excess and precipitates Fe which commences to go into solution, and so repairs and reinforces oxide film already present. It is conceivable that some inhibitors may reduce "probability" of corrosion commencing, and yet increase the "Conditional velocity of attack." PRK (4)

Corrosion Tests (Les essais de corrosion des métaux.) R. CAZAUD. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, July 1932, pages 257-262. Different methods of corrosion tests are reviewed, and a classification of types of corrosion is attempted. Corrosion by liquids can be classified as: (1) Continuous immersion, (2) Alternating immersion, (3) Spraying. Factors accelerating this action are: aeration, temperature, and concentration of corroding agent in the liquid. Measurements of effect of corrosion are: (1) Appearance, (2) Change in weight, (3) Elevation of temperature and evolution of gases, (4) Changes in mechanical properties, (5) Electrical measurements, e.m.f., of dissolution and pH value. Laboratory methods of testing are described in detail by means of drawings and sketches which would enable any one to perform them. GTM (4)



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Necessity for Uniformity in Corrosion Testing of Materials for Chemical Equipment. (Die Forderung nach einheitlichen Richtlinien für die Korrosionsprüfung von Werkstoffen für den chemischen Apparatebau.) FRITZ HILDEBRANDT. *Chemiker-Zeitung*, Vol. 56, Aug. 31, 1932, pages 689-690. Necessity for deciding on standard methods of corrosion testing and reporting full data is stressed. Reports of corrosion tests should include composition and strength of corroding reagent, composition, physical condition and surface condition of material being tested, method of testing with complete details, and qualitative or quantitative evaluation of results. CEM (4)

Corrosion-Resisting and Heat-Resisting Alloy Cast Irons. The Development of Silicon and Austenitic Materials. J. E. HURST. *The Dyer*, Vol. 68, Sept. 16, 1932, pages 303-305. Development during recent years of alloy cast irons, having in addition to common properties of cast Fe, a high degree of resistance to corrosive effects and effects of high temperature conditions, is not quite so well known as corresponding developments in alloy steels. One alloy cast Fe is quite well known in chemical industry. It has a Si content between 14.0 and 15.0%, and is marketed under various names such as Corrosiron, Tantiron, Ironac, and Duriron. It is practically unattacked by H_2SO_4, HNO_3, HCl, or acetic acid, concentrated or dilute, hot or cold. It is, however, attacked by alkalies in a manner exactly similar to ordinary cast Fe. It is not recommended for use with Br, HF or hydrofluosilicic acid when concentrated, hot concentrated ferric chlorides, chlorides of sulphur, caustic solutions, H_2SO_3 and certain sulphates. This alloy has approximately same sp. gr. as cast Fe and a slightly lower electrical conductivity. Coefficient of expansion is higher, being 1.565×10^{-5} as compared with 0.672×10^{-5} for ordinary gray Fe. Thermal conductivity is lower, being 0.1250 as compared with 0.1439 (silver=1). Outstanding disadvantage of this alloy is its excessive hardness and brittleness, hence it is unmachinable by ordinary methods. This difficulty of machining and lack of strength properties imposes serious limitations on its use and led to development of austenitic cast irons which are freely machinable and have excellent strength properties. At same time these properties are accompanied by very good heat-resisting properties and corrosion resistance equal if not superior to brass and bronze. Corrosion resisting austenitic cast irons are marketed under the names of Nimol and Ni-Resist. They contain essentially 14-15% Ni, 6-7% Cu and 2-4% Cr. A modified form of austenitic cast Fe is developed by British Cast Iron Research Association under name of Nicrosilal. 2 compositions of this alloy are recommended for general use. One of them is soft and readily machinable and other is hard and unmachinable. Compositions are Si 6.0%, Ni 18%, Cr 1.5% for soft alloy and 3.5% for hard alloy. Soft-grade Nicrosilal has a tensile strength of 16 tons/in.^{2} and an elongation in cold of 3% in 2". Brinell hardness is 140 to 143. In a series of scaling tests in an ordinary gas muffle scaling did not begin in case of soft alloy until temperature reached 1150° C. With hard alloy material began to melt at 1150° C. before any scaling or oxidation was observed. GG (4)

Behavior of Steel at Forging Temperatures with Respect to Scaling Losses. DONALD W. MURPHY. *American Gas Association Monthly*, Vol. 14, Aug. 1932, pages 330-335. Paper presented at June Convention of American Institute of Iron & Steel Electrical Engineers, Pittsburgh. After study of economic losses involved through oxidation losses, fundamental laws resulting from study are stated as follows: Scaling losses are, at least in most cases, strictly a function of area exposed. They are increased by increasing flow of gas but attain a constant value for velocities of 10 or 20 feet/min. and higher. Scaling increases with increasing time, but does so at a diminishing rate. Oxidation increases with increasing temperature and becomes very great when melting point of oxides, about 2480°F. is exceeded. Scaling losses increase with increasing partial pressure of oxidizing gas. A study is made of equilibrium compositions for system $Fe-FeO-H_2-H_2O$ and for $Fe-FeO-CO-CO_2$; charts are given showing these results as determined and compiled. Scaling of steel may be predicted from these data. Presence of as little as 0.1% SO_2 in products of combustion seriously increases scaling losses at all temperatures in forging range and larger amounts increase these losses still more. Free O should be avoided at all times. RJC (4)

Applicability of Lead and Copper Pipes for Drinking Water Lines. (Über die Verwendbarkeit von Blei- und Kupferrohren für Trinkwasserleitungen.) G. NACHTIGALL. *Gas und Wasserfach*, Vol. 75, Nov. 26, 1932, pages 941-949. Results of extensive tests on amount and course of corrosion of new Pb and Cu drinking water pipes are reported. Amount of metal absorbed by drinking water was not found to be detrimental to health. 18 references. GN (4)

Special Alloy Steels as Applied to Chemical Engineering. T. G. ELLIOT, R. J. SARJANT & W. CULLEN. *Journal Society Chemical Industry*, Vol. 51, June 10, 1932, pages 502-514; June 17, 1932, pages 527-531. Comprehensive review of alloy steels together with detailed data on physical properties and corrosion resistance of 23 alloys including Cr-Ni; Cr-Ni with Cu, W, Ti and V; Cr-Ni-W-Cu; Cr-Ni-Mo; Cr-Ni-Cu-Mo; and Ni-Mn-Mo. Data are given on resistance to various concentrations of hot and cold H_2SO_4, HCl and acetic acid and resistance to high temperatures and to scaling. Corrosion brittleness tests of 18-8 Cr-Ni alloy are made and it is concluded that the only element which effectually prevents corrosion brittleness is Ti. The conditions to be met in various industries and the alloys most generally used are discussed. 31 references. VVK (4)

Choosing and Using Materials for Chemical Plant Construction. W. S. CALCOTT & THEODORE R. OLIVE. *Chemical & Metallurgical Engineering*, Vol. 39, Sept. 1932, pages 476-478. Some principles are outlined upon which may be based selection of corrosion resisting alloys. First is elimination of unfit materials through use of literature, preferably manufacturers' data or reference books rather than non-specific literature, and routine tests of simplest nature possible. Tests with process fluids should then be carried out, special attention being given to impurities. Fabrication methods should then be investigated, especially to avoid trouble at joints. Temperature, method of heating and agitation are other items of importance which must be considered. PRK (4)

The Significance of H_2 Absorption by Fe in the Corrosion Process. (Die Bedeutung der Wasserstoffaufnahme des Eisens für den Korrosionsvorgang.) U. R. EVANS. *Korrosion und Metallschutz*, Vol. 8, Mar. 1932, page 68. The central portion of a metal under a drop was found to be attacked in atmospheres saturated, unsaturated, and supersaturated with H_2O vapor. In the case of half immersed plates unattacked areas were observed near the water line under atms. of O_2 and air. Under N_2 and H_2 the attacked areas reached up to the water line. BER (4)

The "Fogging" of Nickel. W. H. J. VERNON. *Journal Institute of Metals*, Vol. 48, 1932, pages 121, 145; *Korrosion und Metallschutz*, Vol. 8, Apr. 1932, page 93. Includes discussion. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 341. EF (4)

Cleaning Water Mains. ARTHUR T. CLARK. *Water Works Engineering*, Vol. 85, Dec. 14, 1932, pages 1473-1474. Discussion with vivid illustrations of the effects of growths or tuberculations on water mains. Methods of cleaning water mains and economies resulting are pointed out. CBJ (4)

Determination of Loss in Weight in Corrosion Tests. (Sur la détermination de la perte de poids dans les essais de corrosion.) JEAN COURNOT & MARCEL CHAUSSAIN. *Comptes Rendus*, Vol. 194, May 23, 1932, pages 1823-1824. Usual method of brushing and washing corroded specimens is very inaccurate. Authors suggest, at least for Fe alloys, immersion of specimen in boiling caustic soda into which powdered Zn is thrown. Another process depends on analysis of corroded material itself. Conclusions reached from authors' experiments (made on Fe) are that first of 2 suggested methods is rapid and accurate, while second is useful when there is much corrosion. OWE (4)

Corrosion Resistance of a New Dental Alloy "Chrogo U 42." (Über die Korrosionsbeständigkeit einer neuen Zahnlegierung "Chrogo U 42"). H. CHOULANT. *Zeitschrift für Metallkunde*, Vol. 24, Oct. 1932, pages 263-264. Usefulness of various dental alloys is discussed. A new alloy with 39.8% Au, 45.0% Cu, 14.0% Ni, 1.0% Cr, 0.2% Pt is both sufficiently plastic and corrosion resistant. Loss in weight of 17 dental alloys, including Chrogo U 42, in a solution of 1% NaCl and in a solution of 1% lactic acid and 0.25% NaCl, together with appearance of alloy surface, is shown in a table. RFM (4)

Die-Cast Metals and Alloys. Report of A. S. T. M. Committee B-6, H. A. ANDERSON, Chairman. *Preprint* No. 23, June 1932, *American Society for Testing Materials*, 21 pages. Includes progress reports of subcommittees. Subcommittee V on Exposure and Corrosion Tests (W. M. Peirce, Chairman) has prepared tables showing the physical properties of the committee's test specimens after one year's exposure (from July 1929 to July 1930) at test locations under 9 different climatic conditions. Zn-base alloy XXI (Cu 3%, Al 4%, Mg .01%) was quite superior to other alloys. Subcommittee VI on Finishing Properties of Die Castings (J. C. Fox, Chairman) has prepared a 40-page report which will be published later. VVK (4)

Corrosion in a Groundwood Pulp Mill. I. H. ANDREWS. *Paper Trade Journal*, Vol. 95, July 21, 1932, pages 34-35. In the days of open systems with plenty of fresh water, acidity was not much of a factor. With present-day closed systems pH values range from 4.0 to 5.0. Neutralization cannot always be accomplished without discoloring the product. Corrosion resistant materials offer a solution to the problem. CBJ (4)

Results Obtained in Protection Against Corrosion of Ferrous Metals. (Résultats Obtenus dans la Lutte Contre la Corrosion des Métaux Ferreux.) R. ARZENS. *Bulletin de l'Association Technique de Fonderie*. Vol. 5, May 1932, pages 147-154. Protection against corrosion can be obtained in following ways: (1) Production of new corrosion resisting alloys. (2) Use of non-ferrous metals more resistant than ferrous alloys. (3) Protection of metals by means of coatings (a) Metallic coatings (Zn, Cd, Al, Sn, Pb, Cu, Ni, Co, Cr), (2) coatings with metallic salts (parkerisation, parcolite, bonderisation), (c) Vitrified enamels, (d) Paints. Corrosion tests: (1) Laboratory tests : (a) salt-spray chamber, (b) constant immersion, (c) alternating immersion, (d) accelerated electrolytic corrosion test. (2) Industrial practical tests. The latter are of very long duration but give the most valuable results. Results of comparative tests on malleable iron fittings protected with : (a) Zn, (b) parkerisation plus parcolac, (c) parcolac alone. Best results are obtained with coating (b). Other results for different coatings (parkerisation, PbO_2, Ni, Sn, Zn) are given in a table. FR (4)

The Corrosion of Metals in Tan Liquors. M. P. BALFE & H. PHILLIPS. *Journal International Society of Leather Trades Chemists*, Vol. 16, Mar. 1932, pages 120-127; Apr. 1932, pages 194-201. Mechanism of corrosion of metals by liquids and of factors other than rate of corrosion, which must be included in consideration of suitability of metals for use in contact with tan liquors, resistance of various metals and alloys to corrosive action of acid and alkaline solutions and vapors discussed. Cylinders of various metals and alloys were immersed in (1) a "tail suspender liquor," and (2) a "bleach" liquor, for 16 days at 18°-20°C., and liquors were analyzed for metals concerned. Least corrosion shown by Fe-Ni-Cr alloys of stainless type, which were better than non-ferrous alloys tested. 12 references. WHB (4)

The Explanation of the Problems of Corrosion Protection by Means of Colloid Chemistry. (Zur Deutung von Problemen des Korrosionsschutzes mit Hilfe der Kolloidchemie.) W. BECK. *Oberflächentechnik*, Vol. 9, Dec. 6, 1932, page 244. Develops a theory which explains action of rust protective agents by assuming that these agents are colloidal systems. Question of mechanical properties in relation to efficacy of coating is discussed but relation is denied. Ha (4)

Behavior of Activated Carbon with Metallic Water-Purification Equipment. A. S. BEHRMAN & H. GUSTAFSON. *Industrial & Engineering Chemistry*, Vol. 25, Jan. 1933, pages 59-60. It has been found that a relatively high potential difference is set up between a bed of activated C and the metallic water-purification equipment in which the C is used. This behavior is not exhibited by wood charcoal or other carbons previously used in water purification. A dielectric lining is now provided for such metallic equipment in order to avoid injury to the C, contamination of the water, and eventual destruction of the metallic equipment. Typical comparative data are given showing the potential differences set up between various types of carbons and a number of metals. MEH (4)

The Effect of Alkalies and Salt Solutions on Boiler Materials. (Der Einfluss von Laugen und Salzlösungen auf Kesselbaustoffe.) E. BERL & H. HINKEL. *Archiv für Wärmewirtschaft und Dampfkesselwesen*, Vol. 13, Nov. 1932, pages 298-300. Tests were carried out in the apparatus previously used and described in *Zeitschrift Verein deutscher Ingenieure*, Vol. 72, 1927, page 1476. Samples of straight C and alloyed steels were shaken with the solution in a bomb at 310° C. and 100 atm. abs. As a measure of corrosion the O number was determined, i. e. mg. of O absorbed/g. of boiler steel. 4 straight C steels, 1 Cr, 1 Ni and 1 Cr-Ni steel were tested. Corrosion and mechanical properties after treatment with various solutions were determined. Results show that attack of NaOH on Fe is a minimum at concentration of .4 – .9 g./l. At NaOH concentrations below 10g./l., which are not very detrimental, soft steel shows highest corrosion stability. At higher dangerous concentrations alloy steels are superior, Cr-Ni steel has highest stability. Additions of $MgSO_4$ decrease attack at concentrations of 1.2 g./l. This protective action lags far behind that of Na_2SO_4. Large additions of Na_3PO4 (16.4–92.0 g./l) increase corrosion. Elongation of nearly all of the steels is essentially decreased by treatment with alkalies of 250-300 g./l. and by addition of 82 g./l. Na_3PO_4. Elongation of the Cr-Ni steel is not affected. Notch toughness of soft steel is not considerably affected by concentrated alkalies (500 g./l.). 5 references. GN (4)

Lowering the Endurance Strength by Corrosion. (Herabsetzung der Schwingungsfestigkeit durch Korrosion.) R. KÜHNEL. *Maschinenbau*, Vol. 10, Nov. 19, 1931, pages 700-702. Experiments on steel castings of about 65 kg./mm.^{2} tensile strength are described. They show a 30 to 40% decrease in endurance strength after rust had been formed on samples of electric steel. No rust and no such decrease was found on stainless steel samples. Other experiments on steel from 36 to 57 kg./mm.^{2} tensile strength gave a decrease of 10 to 30% with Cu steel showing greatest decrease. Axles of railroad cars underneath washrooms are said to have shown endurance fracture whereas other axles of same cars were sound. These axles are protected by layer of dust and oil against attack of weather. RFV (4)

Accelerated Corrosion Tests and Stainless Steels. Influence of the Condition of the Surface. (Les essais de corrosion actives et les aciers inoxydables. Influence de l'etat de la surface.) J. COURNOT. *Revue du Nickel*, Vol. 3, July 1932, pages 95-98. Describes corrosion testing methods standardized by French Aeronautical Commission of Corrosion Studies and discusses effect of surface on reproducibility and dependability of tests. AH (4)

The Relation between Regular Atom-distribution and Resistance Limits. (Über den Zusammenhang zwischen regelmässiger Atomverteilung und Resistenzgrenzen.) U. DEHLINGER & F. GIESEN. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 197-198. Absence of resistance limit at 50 atomic % in an electrodeposited Cu-Zn alloy, and presence of such a limit in a cast alloy of same composition must be explained by a high solution potential of very small crystals (as shown by X-ray diffraction) in electrodeposited alloy, masking any effect from the type of atom distribution. Accordingly behavior of this alloy does not support assumption of regular atom distribution as a cause for observed resistance limit. RFM (4)

The Use of Sodium Phosphate for Suppressing Boiler Scale in Germany. (L'Emploi du Phosphate de Soude comme Détartrant en Allemagne). R. Deullin. *Chaleur et Industrie,* Vol. 13, June 1932, pages 396-402. Results obtained show that there is no corrosive action due to phosphate. Phosphate has a definite action on scale, deposition of which can be retarded with sufficient concentration. This high concentration is not permissible with all types of boilers. Use of phosphate is only possible in large installations where control of suitable concentration can be effected. FR (4)

Corrosion of Iron and Steel in Ship Construction. Recent Developments. J. W. Donaldson. *Iron & Steel Industry & British Foundryman,* Vol. 6, Nov. 1932, pages 43-46. Ship plates should be subjected to prolonged weathering, scraping, pickling or sand-blasting to completely remove mill scale which appears to be more adherent than formerly. They should then be covered with a good protective base paint which in itself is covered with anti-corrosive paint. CHL (4)

The M.V.B. Process for the Protection of Aluminum and Its Alloys. (Un procédé efficace pour la protection de l'aluminium et de ses alliages: le procédé M.V.B.) Eckert. *Revue de l'Aluminium et de ses applications,* Vol. 9, Jan.-Feb. 1932, pages 1654-1656. See *Metals & Alloys,* Vol. 3, June 1932, page MA 162. AH (4)

Oxide Coatings on Aluminum. J. D. Edwards, Martin Tosterud & H. K. Work. *Electrical Engineering,* Vol. 51, Nov. 1932, pages 778-780. Characteristics of oxide film and some of its many uses are described. Breakdown voltage of oxide films is roughly proportional to thickness of film, and is dependent upon specific physical and chemical characteristics of film. Oxide coat is harder than base metal. Certain types can be colored readily with dyes and mineral pigments. WHB (4)

The Theory of Passivity Phenomena. XVI. The Properties of Natural Protective Layers on Iron after Various Mechanical Pretreatments. (Zur Theories der Passivitätserscheinungen. XVI. Über die Eigenschaften der natürlichen Deckschichten auf Eisen bei verschiendener mechanischer Vorbehandlung.) W. J. Müller & W. Machu. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 161, Oct. 1, 1932, pages 411-420. Electrolytic Fe samples after being ground with different grades of emery paper and exposed to atmospheric corrosion for 24 hrs. were placed in Na_2SO_4 and NaOH solutions. Amp./volt curves were taken. Size of pores varies considerably according to pre-treatment. Area of pores derived from mean values of initial current is largest in case of samples ground with coarse emery paper and ground and polished with wet Al_2O_3 in usual manner. A distinct minimum was noticed with electrode surfaces ground only medium fine (00). Resistance of surface film also varies, but less than size of pores and is practically independent of the previous treatment. This proves that natural film uniformly covers Fe irrespective of macroscopic form of its surface. EF (4)

Theory of Passivity Phenomena. XV. The Passifying Effect of Oxide Films Produced by Anodic Passification of Iron in Neutral Na_2SO_4 Solutions. (Zur Theorie der Passivitätserscheinungen. XV. Über die passivierende Wirkung von Oxydschichten bei anodischer Passivierung von Eisen in neutraler Na_2SO_4-Lösung.) W. J. Müller & W. Machu. *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse,* Abt. IIb, Vol. 141, No. 4/5, 1932, pages 279-305. Fe electrodes with natural and artificial oxide films were studied with the aid of an oscillograph in neutral Na_2SO_4-solutions. Resistance of pores to current passage was determined independently from resistance of oxide surface layer. Free pore area has been determined by 3 different methods agreeing to 10^{-4}cm.^{2} for artificially oxidized electrodes and to 10^{-3}cm.^{2} for electrodes exposed to atmospheric oxidation. Fe encountered in pores is always active and chemical passification can only be ascribed to oxide layer on Fe. EF (4)

The Electrode Potential of Iron. II. The Effects of Occluded Hydrogen and some other Factors upon the Electrode Potential of Iron. III. Corrosion of Iron in Water in Absence of Oxygen and Determination of Solubility Product of Ferrous Hydroxide. Kwanji Murata. *Journal Society of Chemical Industry,* Japan, Vol. 35, July 1932, pages 290B-295B; Nov. 1932, pages 523B-533B. Electrode potential of Fe is affected neither by occluded H in Fe nor by degree of subdivision of reduced Fe, but presence of oxide or hydroxide causes various abnormal electrode potentials depending upon state of contact with Fe, that is, compact oxide film produced by action of air on Fe gives an entirely opposite effect on e.m.f. at beginning to that given by the loose oxide or hydroxide on electrode surface. Experiments were carried out as follows: measurements with the exclusion of occluded H, effect of pH in the electrolyte, effect of reducing temperature, and effect of colloidal hydroxide in contact with Fe electrode. Average values of solubility and and solubility product of $Fe(OH)_2$ determined by 3 independent methods are summarized. In calculating solubility from conductivity data and pH value and solubility product from solubility data, complete ionization was assumed. Values of constants derived from solubility agree well with those from conductance or from pH value. This agreement is substantial evidence of correctness of assumption that complete ionization takes place in saturated solution of $Fe(OH)_2$. MAB (4)

Corrosion between Pickling and Galvanizing in Metalware Galvanizing. Wallace G. Imhoff. *American Metal Market,* Vol. 39, May 6, 1932, page 5; May 7, 1932, pages 5, 6. Subject of corrosion between pickling and galvanizing is not only important in metalware galvanizing, but in all other fields of hot galvanizing. This corrosion results directly in a lowering of quality of Zn coating and an increase in amount of dross produced. A clear discussion of factors influencing corrosion is made. This is followed by 16 examples of actual plant practice of pickling and dip conditions. Emphasis is laid on general features of corrosion, causes and chemical changes believed to take place. Practical importance of corrosion as it affects dross production and quality of coating is stressed. DTR (4)

The Rate of Solution of Zinc in Acids. Cecil V. King & M. M. Braverman. *Journal American Chemical Society,* Vol. 54, May 1932, pages 1744-1757. The rate of solution of Zn in acids was measured. The simplification of the results obtained in the presence of certain oxidizing agents has been shown, the effect of acid concentration, rate of rotation and the temperature coefficient has been studied; and comparison of rate with those for other metals made. MEH (4)

Magnetic Permeability Tests of 18 Per Cent Chromium, 8 Per Cent Nickel Stainless Steels. Report of Subcommittee G of the Joint Research Committee on Effect of Temperature on the Properties of Metals. C. L. Kinney, Jr., Chairman, *American Society for Testing Materials, Preprint* 31, June 1932, pages 20-22. 2 types of 18-8 Cr-Ni alloys, one containing 0.6% C and other 0.085% C, were tested for magnetic permeability by 2 laboratories. The "critical ranges" as shown by permeability are in fair agreement with those found by impact tests. Main object of securing magnetic permeability data was for correlation of permeability with corrosion rate, since at time this work was outlined there was controversy as to the existence of a relation between permeability and corrosion. No conclusions can be drawn on this score until the corrosion tests have been completed and reported. VVK (4)

Corrosion Tests on Colored Cadmium Coatings. (Korrosionsprüfungen an gefärbten Kadmiumüberzügen.) H. Krause. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle,* Vol. 6, Aug./Sept. 1932, pages 50-54. Cd platings which were colored black, brown or otherwise by chemical treatments were tested in how far this treatment influences rust-protecting qualities for which Cd plating is intended. Samples were exposed to salt water spray, atmospheric influence and dipping. It could be stated that black-coloring by Cu salts reduced rust protection under action of salt solutions; it was fairly good for atmospheric conditions. Brown coloring by potassium permanganate does not impair rust protective action of Cd plating. Both colorings behave better unprotected than if coated with zapon lac or similar agents. Ha (4)

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Iron as Hydrogen Electrode. (Das Eisen als Wasserstoffelektrode.) E. LIEBREICH. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 161, Aug. 1932, pages 97-112. With increasing HCl concentrations, the potential of Fe becomes baser up to 1/1250 *N*. At still higher concentrations reversion takes place. This break point is shifted to lower acidities if H_2 is present. Reversion point at —0.43 volts practically corresponds to equilibrium potential of Fe established by Richards & Behr. The pH at break point is almost identical with concentration at which dissolution speed of Fe begins to increase rapidly with visible H-liberation. (Whitman, Russel & Alteri). In spite of an analogous behavior, absolute potential values of Fe-electrode are materially less noble than those of an H-electrode. Cathodic H-overvoltage on Fe decreases with rising pH. Amp./volt curves in 1/1000 and 1/1500 *N* HCl show anomalies which point to a suddenly occurring relief in H_2 liberation during polarisation. Phenomena are interpreted with assumption that Fe and H are able to form a solid solution at break point of potential when saturation point of Fe for H is just attained. EF (4)

Dollars and Cents—"The Operating Cost of Corrosion." C. L. MANTELL. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 479-480. Following equation for economic comparison of corrosion resisting materials is given: O.C.C. = 10/L(M + F + Sh + I + R — S) — B, where O.C.C. is operating cost of corrosion, L—expected life in years, M—total cost of material, F—fabrication cost, Sh—shipping cost, I—installation cost, R—cost of removal and salvage, S—salvage or scrap value, B—cost of particular piece of equipment, 10—number of years generally suitable for comparison. An example is given for illustration. PRK (4)

The Metal Wear Problem as Seen by the Manufacturer of Metals. J. MAYER. *Monthly News Letter, Ohio Ceramic Industries Association,* Columbus, O., Vol. 3, Oct. 1932, 3 pages. Mimeographed. Brief discussion of wear of muller tires in grinding ceramic materials. An undescribed Cr-Mo steel casting, heat treated, is advocated for this service over Mn steel or chilled Fe. Some service records are given. HWG (4)

Modern Nitric Acid Production Demands Special Alloys. THOMAS MCKNIGHT. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 490-492. Materials problems involved include: resistance to acid corrosion, resistance to scaling in highly oxidizing gases at elevated temperatures, prevention of contamination, and decomposition of materials in process. Marked progress has been made in production of corrosion resisting alloys, but average corrosion penetration recorded for samples recently tested is very much higher than average obtained 3 years ago, which was about 0.035"/yr. With Cr alloys quality must be worked into material in every process from melter to roller who may injure the structure by excessive reductions per pass. All fabrication should be done under rigid inspection. PRK (4)

Action of Polished Metal Surfaces. (Zur Kenntnis des Wertes der Metallpolitur.) M. MEIER. *Chemisch-Technische Rundschau,* Vol. 47, June 28, 1932, pages 222-223. Discusses effect of surface state of metals on their strength properties, corrosion stability and catalytic action. EF (4)

Dye Industry Searches for Cheaper Plant Materials. HUGH MILLER. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 486-488. Materials used for different chemical reactions as carried out during manufacture of dyes are described. Because comparatively few products are manufactured in large enough tonnages to justify capital expenditure, introduction of expensive metals and alloys has been hindered. PRK (4)

Pulp and Paper Advance in Fight Against Corrosion Loss. J. D. MILLER. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 484-486. Short outline is given of unit operations involved in making paper and of chemical and mechanical action to which materials are exposed. Success has accompanied use of Ni-Cr steel castings and wrought metal. Cr plating has also given excellent service. PRK (4)

Corrosion Protection in Cracking Equipment. JACQUE C. MORRELL & GUSTAV EGLOFF. *Industrial & Engineering Chemistry,* Vol. 24, May 1932, pages 509-513. Methods of protection against corrosion in cracking equipment, internally heated by hot oil and vapors, are discussed. Cement linings, ganister and nonmetallic, alloy linings of Cr steel and Cr-Ni steel, are described as to composition, preparation of surface to be lined, method of applying lining material, and durability in service. MEH (4)

Criticism on Optical Experiments to Prove Removal of Layers on Iron. (Zur Kritik der Versuche, die Entfernung von Schichten auf Eisen optisch nachzuweisen.) W. J. MÜLLER & W. MACHU. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 161, Aug. 1932, pages 147-153; discussion by L. TRONSTADT, W. J. MÜLLER & W. MACHU, pages 154-158. Controversy precipitated by a previous paper of Tronstad (See *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 158, Feb. 1932, pages 369-397) on the passivity of Fe and steel. Müller & Machu proved experimentally by time-current curves relating to anodic and cathodic behavior of Fe-electrodes that a removal of natural oxide layer on Fe does not take place in solution applied by Tronstad. Tronstad's conclusions from his optical method based on removal of this surface film are erroneous. It is furthermore denied that, after film stable in air has been removed, passivity of an Fe-surface is due to formation of an oxide layer. Optical differences are ascribed to changes within the surface film. EF (4)

Prevention of Pitting Caused by Cavitation in Water Wheels. T. C. STABLEY. *National Electric Light Association Bulletin,* Vol. 19, Sept. 1932, pages 539-545. Cavitation is a phenomenon encountered particularly with high speed turbine runners because of the reluctance of the water, when the draft head is high, to follow the back of the blade. The result is that the water leaves the surface, forming voids or cavities filled with a small amount of air and water vapor. It is the crashing collapse of these bubbles which causes severe deterioration of exposed metal. Runner metal must be, therefore, most durable. For this reason runners of cast Fe were given a surface coating with stainless steel. Due to different chemical composition, expansion coefficient and physical properties of stainless steel and cast Fe, former cannot be welded immediately to Fe surface but intermediary layers of some other steels must be applied. A decided advance in runner construction will be attained when entire runners are made of stainless alloy or some other enduring metal; however, a considerable reduction in present costs must be made to warrant its use. Use of rubber having high resiliency and toughness would provide protection at a much lower cost compared with metals, but means for applying rubber to the metal must first be perfected. A still less expensive solution may be found in the application of rubber paint, which although by no means durable, is so much cheaper that its more frequent application can be made at such low cost as to be considered negligible. These conclusions, although obtained on tests with Francis turbines, are applicable to other types. Ha (4)

Calculating Remaining-Strength in Lang Lay Hoisting Ropes. E. R. TAYLOR. *Mining Congress Journal,* Vol. 18, Oct. 1932, pages 14-17, 22. Factor of safety required for a new shaft hoist rope should be chosen in accordance with type of installation being considered in order that most economical rope service, with safety, may be obtained. Approximate time to remove such a rope from service represents an entirely different phase of rope-life. Author presents a series of charts for calculating remaining metallic-area of a worn Lang Lay rope from a surface inspection. By correlating remaining area to actual ultimate strength tests of worn ropes from same installation it is possible to approximate remaining strength of rope so that it may be removed when minimum safety factor is approached. Ordinarily real measure of safety is that additional length of time rope will continue to satisfactorily meet operating conditions. When matter of corrosion enters in a problem, remaining strength cannot be calculated with safety. It is emphasized that corrosion can be controlled by proper and sufficient lubrication. DTR (4)

Corrosion as a Physico-Chemical Problem. (Die Korrosion als physikalisch-chemisches Problem.) H. MARK. *Forschungen und Fortschritte,* Vol. 8, Jan. 20, 1932, pages 37-38. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 291. EF (4)

The Importance of Chemical Reactions for the Corrosion of Metals. (Die Bedeutung der chemischen Reaktionen für Korrosion der Metall.) G. SCHIKORR. *Oberflächentechnik,* Vol. 9, Nov. 1, 1932, pages 219-220. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 104. Ha (4)

A Modified Impingement Corrosion Apparatus. H. W. BROWNSDON & L. C. BANNISTER. *Metal Industry,* London, Vol. 41, Sept. 23, 1932, page 300. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 102. Ha (4)

Rust Protection and Rust-Protective Paints. (Rostschutz und Rostschutzanstrich.) HERMANN SUIDA & HEINRICH SALVATERRA. Julius Springer, Berlin, 1931. Cloth, 9¼ x 6¼ inches, 344 pages. Price 24RM. The authors have produced an excellent general treatise on the technique and the underlying fundamentals of paints. An adequate historical account is given of corrosion theories. Binding materials, oils, cellulose lacquers, etc., pigments, driers and diluents, application, testing of paints, and the testing of paint materials are comprehensively covered. The book is well illustrated especially with micrographs. Footnotes and references add considerably to the background of the material presented. A bibliography of about 900 references is added. An effort has been made to include the more recent paint materials. The aim of the book as stated by the authors is to provide a sufficiently comprehensive and yet readable technical book from which the average engineer can derive the maximum information for his purpose. For the technical worker the additional literature references supplement the information given. They have more than accomplished their aim and the result is a book that is a valuable addition to paint literature. V. V. Kendall (4)-B-

Corrosion-Resistant Cast Iron. Development of the Austenitic Alloys. *Chemical Trade Journal & Chemical Engineer,* Vol. 90, May 20, 1932, pages 499-500. Abstract of Special Bulletin, Bureau of Information on Nickel. Austenitic cast irons are produced by adding large amounts of Ni and Mn to ordinary cast irons. They show the following properties: a marked degree of corrosion resistance; superior heat resistance; decreased magnetic properties; a high electrical resistance; a low temperature coefficient of resistance; and a high coefficient of thermal expansion. The mechanical properties are similar to those of ordinary cast irons. They are readily machined and welded but heat treated with difficulty. The austenitic structure requires 20% Ni. Cu may replace 1/3 of the Ni content. A representative austenitic cast Fe alloy may contain 14% Ni and 7% Cu. Mn may be used up to 5% and Cr up to 6%. A high Ni alloy may contain 40% Ni with 15% Cr. These alloys show a high resistance to caustic alkalies and weak acids (except nitric) and are very resistant to oxidation and to repeated heating. Present uses include valves, retorts, pipes, fittings, and furnace castings. JN (4)

Life of Steel Sheet Piling. *Iron Age,* Vol. 129, June 9, 1932, page 1247. Report of steel sheet piling after 19 years exposure by Carnegie Steel Co. Composition of piling was: C 0.22%; Mn 0.44%; P 0.011%; S 0.035%; Si 0.032%; Cu 0.01%. Investigation showed that in severe exposure, such as alternate wetting and drying, piling lost less than 1% annually. VSP (4)

Extensive Study of Underground Corrosion and Its Prevention Conducted by Government. *Oil & Gas Journal,* Vol. 31, Sept. 1, 1932, page 16. A summary with references to published work of the activities of the underground corrosion section of the Bureau of Standards. VVK (4)

Device Perfected for Studying Corrosion of Welds. *Iron Age,* Vol. 129, June 9, 1932, page 1253. Corrosion in welded boilers, pipes and containers for oil and chemicals studied by Westinghouse Electric & Manufacturing Co. A corrosion device is being used in which test specimens are subjected to intermittent immersion in corroding liquid. Apparatus immerses samples for a definite period, leaving them at rest, and then removing and exposing them to the air for certain time. Corrosive liquids are kept at a constant temperature. VSP (4)

Wool-oil as Rust Protection. (Wollfett als Rostschutz.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Oct. 16, 1932, page 541. According to tests of National Physical Laboratory sheep wool oil is much more effective as rust protection than petroleum oil. GN (4)

Fogging of Polished Nickel Articles. (Die Schleierbildung auf polierten Nickelgegenständen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 25, 1932, pages 519-520. Results of former and recent investigations of Institute of Metals are reviewed. In an atmosphere and at a temperature sufficiently above dew point Ni surface stays bright permanently, but fogging appears as soon as temperature reaches dew point. Minimum relative humidity necessary for occurrence seems to be around 70%. In the beginning film deposited on surface contains $NiSO_4$ and H_2SO_4, in later stages basic $NiSO_4$ is formed. Tendency of Cu-Ni alloys to fogging increases proportionately with Ni content. Cr retards fogging. Grease retards the occurrence; wool grease is better than vaseline. Occurrence is considerably decreased in the dark, indicating that process is caused by sulphates and SO_2 suspended in air. These compounds are catalytically oxidized on surface. When polished Ni or Ni plated articles are subjected to still air at normal temperatures they become immune to tarnishing. Immunization can be produced artificially by traces of H_2S. GN (4)

Boiler Corrosion Due to Steam Dissociation. Practical Experiences. (Korrosion an Dampfkesseln durch Dampfspaltung. Betriebserfahrungen.) *Feuerungstechnik,* Vol. 20, Apr. 1932, page 62. Attention is called to oxidation of Fe accompanied by liberation of H. Phenomenon has been observed even at temperatures of 300°-400° C. The higher the pressure the greater the steam dissociation. Prevention: perfect steam and water circulation. In a single drum boiler with inclined boiler tubes corrosion has been checked by installing special guiding sheets. EF (4)

Gas Holder Maintenance. *Gas Age-Record,* Vol. 70, Sept. 3, 1932, pages 237-241. Committee report presented before the Pacific Coast Gas Association Aug. 1932. An outline for gas holder inspection is given. The most effective method of minimizing internal corrosion available at present appears to be the use of non-drying oils for holder painting. Some rivet corrosion on the inside of the holders was reported. The sheets forming the hydraulic cup and grip are exposed to very severe conditions and the life of the original material is given as from 10 to 20 years. It is recommended that pockets about the structure that will hold water and which are generally neglected be carefully painted. Repainting is done every 4 or 5 years generally. Spray painting requires more paint which more than offsets the saving in labor. Non-drying paints or oils are extensively used in California. VVK (4)

Metallurgical Problems Connected with Internal Combustion Engine Valves. J. R. HANDFORD. *Engineer,* Vol. 154, Sept. 23, 1932, page 309; *Engineering,* Vol. 134, Sept. 23, 1932, pages 350-351. Includes discussion. From paper read before a joint meeting of the Iron & Steel Institute and the Institute of Metals, Sept. 13, 1932. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 103. LFM (4)

Burning Through Kettle Bottoms of Lacquer and Varnish Kettles. (Durchbrennen der Kesselböden bei Lack- und Firniskesseln.) *Farbe und Lack,* Sept. 21, 1932, page 477. Scaling tests at 1000° C. after 100 hours exposure yielded a loss in weight of 416 g. for wrought Fe vs. 6 g. for V2A and after 25 hours at 1200° C., 250 g. and 10 g. respectively. Wrought Fe is less heat resistant than cast Fe. The latter however becomes brittle at extreme temperatures. This can be counteracted by using thicker bottoms. Cu is less stable than wrought Fe. Coke firing is very hard on kettle bottoms. Enamelled kettles are very sensitive to sudden temperature changes. The possibility of mechanical destruction must be borne in mind when using Fe stirring spatulas in Cu kettles. Moderate firing prevents damages during melting down copal varnishes and resins inserted in lump form. EF (4)

Theoretical and Practical Facts on Hot Water. (Theoretisches und Praktisches vom warmen Wasser.) L. H. Haase. *Gas und Wasserfach*, Vol. 75, Nov. 19, 1932, pages 936-937. Corrosion by hot water in contrast to that by cold water is essentially due to O content. Various ways to avoid corrosion by hot water are discussed: (1) suitable installation of whole equipment, (2) pre-treatment of cold water used, (3) proper choice of material is discussed in detail. GN (4)

Corrosion of Copper. (Korrosion von Kupfer.) L. W. Haase. *Metallwirtschaft*, Vol. 11, Sept. 18, 1932, page 516; Sept. 23, 1932, pages 530-531, and Oct. 7, 1932, pages 556-557. In Cu pipes used for cold and hot water lines a certain amount of corrosion takes place. In some cases it consists only of oxidation. Cu ions go into solution, $Cu(OH)_2$ is formed and transformed into CuO. Oxide coatings have no protective action as they are porous and do not form a tight bond with metal. Through action of salts dissolved in water homogeneous protective layers are formed which are permanent and prevent further attack on Cu. Rapidity of formation of this protective skin depends more on nature of cation than anion. Na salts form skin fastest, K salts next and NH_4 salts slowest. Attack of salt solutions on Cu was determined by immersing samples of Cu and sheet Pt in solutions and measuring oxygen depolarization current by means of a sensitive ammeter. With Na salts discoloration is noticeable within 30 minutes and current drops to 0 within a few hours and remains there, indicating that a skin free from porosity is formed. All Na salts which were tested behaved similarly. With K salts reaction lasted for several days, with exception of KNO_3 and KNO_2 which reacted as fast as Na salts. With NH_4 salts reaction is still slower and is accompanied by formation of complex salts. 16 references. CEM (4)

Oxidation Processes in Copper and Its Alloys in Aqueous Solutions and their Electromotive Behavior. (Oxydationsvorgänge an Kupfer und seinen Legierungen in flüssiger Phase und Ihre elektrochemisches Verhalten.) L. W. Haase. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 223-226. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. Formation of protective films in corrosion of Cu and Cu alloys by action of salt solutions containing dissolved O in an electrolytic cell was studied. Rate of formation of protective film was determined by rate of decrease of current flow in a cell Cu (or Cu alloy)/Salt solution/Pt. Alkali halide salt solutions of various concentrations were studied. It was found that cation is chiefly important in formation of protective film, the greater the difference between the normal potential of the cation and that of H, the smaller the velocity of formation. Thus the protective layer was found to be essentially formed in NaCl after only a few hours, in KCl after several days, and in NH_4Cl after a week or more. In spite of differences in velocity the end-product is always a film of absolute uniformity. This type of film is ideal protection against corrosion. Rapidity of film formation may be greatly increased by substituting dissolved oxidizing acids for O dissolved from air. During formation of protective film by ammonium salts an intermediate period of high current flow is found, not found with other salts. This behavior is most pronounced with high concentrations (10%), but also perceptibly with low (0.1%), though somewhat later. Films formed in this way offer protection against corrosion either by salt solutions or by atmosphere. RFM (4)

Corrosion of Iron and Steel. Report of A.S.T.M. Committee A-5, J. H. Gibboney, Chairman. *Preprint* No. 13, June 1932 meeting, *American Society for Testing Materials*, 56 pages. Contains progress reports of subcommittees. Subcommittee V on Total Immersion Tests presents reproductions of Cu replicas on sea water riveted tests. Conclusions on sea water immersion tests are postponed until all of 16-gage sheets have failed. Subcommittee VI on Specifications for Metallic-Coated Products are presenting revisions in 6 standards specifications which are quite extensive. Most important changes are: weight and dip class designation for characterizing coatings has been eliminated and weight of coating requirements specified separately from uniformity requirements, where reference is made to Preece test, it is specifically stated "This test shall not be used to determine weight of coating and shall be applied only after coating has been found to conform to weight of coating requirements"; an adherence requirement formerly optional has been included for Zn-coated Fe or steel telephone and telegraph line wire and a similar requirement added for tie wires; a twist requirement has also been added to latter. Progress report of Subcommittee VIII on Field Tests of Metallic Coatings indicates that at any location durability of a Zn coating is substantially proportional to weight of coating. Durability of Zn coatings is less in locations where atmosphere is contaminated with impurities that convert Zn coating into soluble salts than in locations where air is pure or where a protective film is formed. A special committee under chairmanship of W. H. Finkeldey has prepared a program for tests on wire and wire products. Report of Subcommittee X on Embrittlement Investigation will be discussed elsewhere under abstract of that work. VVK (4)

Corrosion of Non-Ferrous Metals and Alloys. Report of A.S.T.M. Committee B-3, T. S. Fuller, Chairman. *Preprint* No. 20, June 1932 meeting, *American Society for Testing Materials*, 51 pages. Main report gives a critical review of accelerated testing procedure particularly of total-immersion, alternate-immersion, spray, salt spray and electrolytic tests. Corrosion tests in field are being conducted by Subcommittees VI, VII and VIII. Photomicrographs, analyses and physical data are given on 33 metals and alloys which are being used in these tests. Subcommittee VI on Atmospheric Corrosion has instituted a 25-year atmospheric test of these metals. There are 9 test locations: rural exposure; State College, Pa., Phoenix, Ariz., industrial exposure; Pittsburgh, Pa., Altoona, Pa., Rochester, N. Y., New York City, sea coast exposure; Sandy Hook, N. J., Key West, Fla. and La Jolla, Calif. 4 plate (9″×12″) and 30 standard tension test specimens of each material are exposed at each location. First test period will end in August 1932. Change in weight of plate specimens and loss in strength and ductility by means of tension tests will be determined. Details of test racks and locations are given. Subcommittee VII on Liquid Corrosion has instituted a field test on 22 metals in solutions of H_2SO_4, HCl, NaOH and NaCl, specimens being exposed within various kinds of equipment, such as evaporators and tanks that are in actual operation handling corrosive liquids. Test racks and specimens are described. No results are reported as yet. Subcommittee VIII on Galvanic and Electrolytic Corrosion has exposed couple combinations of all of following metals at 9 outdoor stations mentioned above: Al, Cu, mild steel, Sn, Zn, Ni and Pb. First of 4 sets will be removed at end of 1 year (Mar.-Sept. 1932). Couple combinations of tension test specimens will also be exposed, totally immersed, in sea water, NaOH, hot water and H_2SO_4. 3 periods of exposure are provided for. From data obtained an attempt will be made to recommend metal combinations which can safely be used in 4 types of exposure without serious galvanic couple action occurring. VVK (4)

Phosphoric Acid Imposes Severe Corrosive Burden. William C. Weber. *Chemical & Metallurgical Engineering*, Vol. 39, Oct. 1932, pages 542-545. In general, stoneware and high-silica, acid-resisting bricks and cement are thoroughly resistant to H_3PO_4. None of the usual metals except Pb are suitable. Out of contact with the solution, Pb is attacked by the gases evolved and must be protected. A considerable amount of low-carbon, Cr-Ni-Mo steel is now being tried and has given almost complete satisfaction. A plug cock of this material is satisfactory with rubber-lined or Pb piping. The construction of particular equipment for the different steps in H_3PO_4 manufacture is described. PRK (4)

Protective Compounds for Idle Equipment. E. R. Woodward. *Chemical & Metallurgical Engineering*, Vol. 39, Oct. 1932, page 568. Best rust inhibitors have a petroleum base, acid free, and are sometimes emulsified with a chromate solution which may be separated out if overheated. Typical formulae are given, all containing rosin and petrolatum. Wax is added to raise the melting point. PRK (4)

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Pipe Line Problems in the Southwest. Stanley Gill. *Chemical & Metallurgical Engineering*, Vol. 39, July 1932, pages 399-403. Corrosion problem is discussed. Oil lines are patrolled by riders who repair leaks. Average number of leaks for pipes less than 5 years old is 1/year/3-5 miles. Repairs cost 1-8% of price of handling. Of total mileage, 10% has a puncture in less than 25 years and 50% is unaffected after 75-100 years. Complete survey for detecting corrosive conditions before laying a pipe may be relied upon as being 90% correct. PRK (4)

Petroleum Pays Increasing Toll to Corrosion. Stanley Gill. *Chemical & Metallurgical Engineering*, Vol. 39, Sept. 1932, pages 481-482. Brief survey is given of corrosion problem as encountered by petroleum industry. Abbreviated list of more destructive corrosive conditions is: (a) Oxygen-free oil-well brines; (b) Aerated oil well brines; (c) H_2S, air and water; (d) Corrosion by soils; (e) Corrosion in low temperature distillation; (f) Corrosion in high temperature distillation. PRK (4)

The Open-Air Corrosion of Copper. Part III. Artificial Production of Green Patina. W. H. J. Vernon. *Engineering*, Vol. 134, Oct. 7, 1932, pages 411, 431-432. Includes discussion. Condensed from paper read before the Institute of Metals, Sept. 14, 1932. See *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 32. LFM (4)

Where Stainless Alloys Stand in Chemical Construction. E. C. Wright & K. E. Luger. *Chemical & Metallurgical Engineering*, Vol. 39, Sept. 1932, pages 494-496. Stainless alloys may be classed in 5 principal subdivisions: (1 a) high C, (1 b) low C 11-15% Cr-Fe alloys; (2) low C 16-20% Cr alloys; (3) 25-30% Cr steels; (4) 18 Cr-8 Ni steels; (5) 25 Cr-12 Ni steels. 1a should only be used in the hardened condition. Class 1 are used where wear resistance and hardness are necessary. Class 2 offer satisfactory resistance to many corrosive agents; if held for appreciable lengths of time at 800° to 1100° F. and cooled, they are brittle but this can be overcome by heating to 1400°-1500° F.; ductile welds are obtained by using 18-8 welding rod. Class 3 alloys are generally used for high temperature work, especially in range 1500°-2150° F. in cases where maximum strength and toughness are not necessary and where service is intermittent. Class 4 alloys are widely used. They have high tensile strength but low yield point which can be raised appreciably by cold working. If ever heated to range 800°-1450° F. they are subject to intergranular corrosion unless subsequently heated to 1700°-2150° F. or else contain special additions such as Ti. These alloys also have excellent high temperature properties. Class 5 are mainly used for heat resistance between 1500° and 2150° F. PRK (4)

Aircraft Finishing. M. R. Whitmore. *Industrial & Engineering Chemistry*, Vol. 25, Jan. 1933, pages 19-23. Framework and surfaces of Army aircraft are painted to obtain a characteristic color scheme and as a protection against corrosion which may cause tremendous changes in the physical properties of the metals. Available protective coatings may be divided into 3 groups: organic (paints, lacquers, greases), metallic coatings (electrodeposits, galvanizing, etc.), and chemical or electrochemical treatments (anodic treatment, Parkerizing, etc.). Each type is used by the Air Corps, and in practically all cases a paint coating is applied to the metal, previously treated by one of the other methods. Practically all steel, brass, and bronze parts and surfaces are Cd plated, and all Al and Al alloy parts are anodically treated. Corrosion and vibration tests show that paint coatings for aircraft should possess, besides durability, the following characteristics: high resistance to permeability by water, pigments which will tend to passivate metals and prevent corrosion, absence of pigments of alkaline reaction, good adhesion to metal which may not be chemically clean, and high resistance to impact and bending even after exposure. MEH (4)

Controlled Data from an Immersion Test. R. F. Passano. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 468-476. Includes discussion. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 102. VVK (4)

STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Micrographic Studies of Age-Hardening Alloys. (Die Ausscheidungshärtung im Schliffbild.) H. Röhrig. *Zeitschrift für Metallkunde,* Vol. 24, Sept. 1932, pages 231-233. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. 3 alloys, essentially of the Al-Cu system with 4.12%, 4.66%, and 6.11% Cu, and one alloy with 0.04% Cu and 1.57% Si were studied. In freshly quenched state (maximum solid solution) these alloys blackened strongly when treated in unpolished state with an etching agent of 5% HCl plus 0.5% H_2F_2. After reheating (decomposition of the solid solutions) blackening on etching was less severe; the greater the precipitation the less the degree of blackening. Photomicrographs are given showing the Widmanstätten structure taken by the precipitate with the customary impoverishment in precipitate of the regions near grain boundaries. Same etching agent may be used to study segregation (coring) on castings. RFM (5a)

The Transformation of the β-Solid Solutions of Brass. (Die Umwandlung der β-Mischkristalle des Messings.) R. Ruer. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Dec. 1932, page 364. Transformation in brass in temperature range of 450° to 470° C. where a single as well as a double transformation was suspected were more exactly investigated by a sensitive thermal method. A double transformation could not be found in any of the alloys containing from 44.7 to 65.6% Cu. It is, however, recommended to study the β-transformation of brass still further. 12 references. Ha (5a)

The Solubility of Aluminum in Magnesium in the Solid State at Different Temperatures. P. Saldau & M. Zamotorin. *Journal Institute of Metals,* Vol. 48, 1932, pages 221-226. Includes discussion. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 4. (5a)

Steel in the Light of the Precipitation Theory. Albert Sauveur. *Metals & Alloys,* Vol. 3, Aug. 1932, page 177. The author describes the changes in steel on hardening and annealing and their explanation in the light of the precipitation theory. WLC (5a)

Allotropic Transformations of Iron at A_3 and A_4 Points. V. N. Svechnikov. *Domez,* No. 4-5, 1932, pages 29-32. (In Russian). Plotting experimentally determined values of specific volume of Fe against temperature and completing curves by interpolation of available figures it was found that volume changes at 960° and 1401°C. are respectively 3.4 and 0.90%. Latter figure checks experimental evidence while former is about twice as high as highest reported (H. Esser, *Stahl und Eisen,* 1927, page 337), equal to 1.8%. Same discrepancy is seen in values of heat evolved at transformation temperatures. Conclusion is reached that impurities of Fe, particularly gases, have a very pronounced effect on changes in specific volumes at transformation points and are responsible for these discrepancies. 15 references. (5a)

Some Notes on Metal Microscopy by Polarized Light. (Einige Bemerkungen zur Metallmikroskopie mittels polarisierten Lichtes.) L. Tronstad. *Zeitschrift für technische Physik,* Vol. 13, Sept. 1932, pages 408-410. Use of linearly polarized light in microscopy of metals is particularly advantageous in examination of anisotropy, orientation and stresses of crystallites. As best results are obtained only for perpendicular incidence of the polarized light an arrangement of an epiphragm is described which makes possible obtaining light under as uniform an angle of incidence as possible. Relation between angle of incidence and changes of light in reflexion from metal are discussed. Ha (5a)

Improved Method of Polishing Metallographic Specimens of Cast Iron. J. R. Vilella. *Metals & Alloys,* Vol. 3, Sept. 1932, pages 205-206. Describes effects of wet polishing in gouging out the graphite in preparation of specimens of cast Fe. Describes a method of preparation involving only one wet polish which successfully eliminates this gouging. WLC (5a)

Polishing. Correspondence Stephen F. Urban. *Metals & Alloys,* Vol. 3, Nov. 1932, pages 262, MA 25. Referring to Vilella's paper on this subject (see *Metals & Alloys,* Vol. 3, Sept. 1932, pages 205-206) writer presents data to show that with improper polishing of cast Fe black portions of field are actually voids and that with proper polishing those portions of field have a structure identical with that of Acheson graphite polished by the same procedure. WLC (5a)

Metallography of Automotive and Aircraft Valves. Eugene D. Viers. *Fuels & Furnaces,* Vol. 10, Sept.-Oct. 1932, pages 513-520; Nov.-Dec. 1932, pages 591-594. Importance of best quality alloy and proper heat treatment to obtain a perfectly sound material free from any internal defects or impurities for this type of machinery is emphasized and discussed in detail. Methods of testing physically, chemically and by X-rays are described. Ha (5a)

Change of Structure of Steel in Hardening and Annealing. (Die Gefügeänderungen des Stahles beim Härten und Anlassen.) H. Hanemann, U. Hofman & H. J. Wiester. *Archiv für das Eisenhüttenwesen,* Vol. 6, Nov. 1932, pages 199-207. C content of austenite and martensite were investigated. Determination of lattice constant of residual austenite shows that undercooled austenite changes, not only on crystallization of tetragonal martensite but also on decomposition of austenite directly to cubic martensite, without a change in distribution of C. Transformations of undercooled austenite cannot be described by a metastable equilibrium between phases of different C contents or related to extended equilibrium lines of Fe-C diagram. An attempt was made to reduce regularities of martensite crystallization to a few "lattice-mechanical" principles: impelling force is effort of Fe atoms of undercooled austenite to go over into less dense arrangement of α-Fe lattice. This effort for transformation is opposed by infiltrated C atoms that lose, at lower temperatures, ability to leave lattice by diffusion. At a definite temperature effort for transformation overcomes resistance of C. Transformation then beginning is incomplete as it surpasses in volume final condition of pearlite and thereby releases opposing forces stopping transformation. Formation of cubic martensite from either austensite or tetragonal martensite upon annealing is caused, according to N. Engel, by a small shift in position of C atoms from center of face-centered cubic unit cell along [110] direction or from face-center of tetragonal prism along [100] direction until C atoms are in mid point of solid figure formed by 2 corner Fe atoms and 2 neighboring body-centered Fe atoms (in α-Fe lattice). Separation of cementite is started by a local accumulation of C by diffusion and can then be described by a comparatively simple transposition of atoms in crystal lattice on basis of conceptions of Hendricks and Shimura of structure of cementite lattice. 30 references. MGL + Ha (5a)

Contribution to the Binary System of Aluminum and Cadmium, Lead and Bismuth. (Zur Kenntnis der Zweistoffsysteme des Aluminiums mit Cadmium, Blei und Wismuth.) M. Hansen & B. Blumenthal. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 19-20. See *Metals & Alloys,* Vol. 3, May 1932, page MA 122. (5a)

Gamma-Alpha Transformation in Wrought Iron. R. H. Heyer. *Metals & Alloys,* Vol. 3, Oct. 1932, pages 226-232. Discusses occurrence of "phantom structure" in wrought Fe in light of previous work. Work is reported covering further studies of superimposed structures occurring in wrought Fe. Micrographs illustrate structures discussed and thermal analysis is recorded. Study leads to conclusions that the γ-α transformation in wrought Fe occurs over a wider range of temperature than in pure Fe, that relatively high impurity content permits of certain diffusions during transformation, that positions of α and γ markings may be observed at room temperature by quenching from transformation range in water, that the "phantom" network found in both pure and wrought Fe contains visible inclusions, that α-veining is observable in Aston wrought Fe after slow cooling from above transformation and that Aston and hand puddled wrought Fe have same γ-α transformation characteristics. 27 references. WLC (5a)

Structure & X-Ray Analysis (5b)

Ternary Systems. (Ternäre Systeme.) G. Masing. Akademische Verlagsgesellschaft, Leipzig, 1933. Paper, 6 x 9 inches, 164 pages. Price 9.60 RM. The author remarks in the preface that although there are many excellent accounts of binary systems in text books and monographs, there is no comprehensive and satisfactory account of ternary systems anywhere in the literature. The author proposes, in this monograph, to supply such an account. It may be said immediately that the need for such a monograph has indeed been great for many years, and that the author's attempt has been most successful.

The monograph begins with a brief though adequate treatment of heterogeneous equilibria, particularly the phase rule, and of the graphical methods of representing ternary equilibria. There is then taken up the various types of ternary equilibria: that of three simple eutectiferous binary systems, of three simple solid solution binary systems, of binary systems two of which are eutectiferous with terminal solid solutions and the third a simple solid solution system, and so on, to include the important combinations of binary systems, of which twelve types of combination have been chosen. Under each type of combination a discussion is given of the full ternary figure; of isothermal sections; of the temperature-composition sections with constant ratio of the composition percentages of two components with a changing percentage composition of the third, and with a constant percentage composition of one component with changing composition percentages of the other two. To this is added in each case a discussion of the various two-dimensional (in the sections) and three dimensional regions, of the graphical methods of construction and interpretation, and of the rules applying to the various equilibria. Following this general treatment the author illustrates the principles derived by means of actual systems, choosing the Fe-Si-Al system, the Cu-Zn-Sn system, and by means of a special treatment of the allotropic modifications of Fe in ternary systems.

The treatment is simple and lucid, yet at the same time quite comprehensive. Beyond doubt this is a very valuable book to the metallurgist, for ternary systems have taken on a new importance in recent years. Together with Tammann's Lehrbuch der Heterogene Gleichgewichte it constitutes a most satisfactory treatment of the type of heterogeneous equilibria in which the metallurgist is most interested.

It has become somewhat trite to remark that books of the quality of this, written in foreign languages, merit translation into English. Until English writers and English publishing houses prove more prolific in the production of standard monographs and texts or until it becomes possible to publish translations from the German, laboratory and research metallurgists will have to continue to depend upon German books for adequate treatment of their subject. Robert F. Mehl (5b)-B-

Influence of Space Lattice Forces on the X-ray Emission Spectrum. (Über den Einfluss der Gitterverbindungskräfte auf das Röntgenemmissionspektrum.) R. Glocker & M. Renniger. *Die Naturwissenschaften,* Vol. 20, Feb. 12, 1932, pages 122-123. Spectroscopic photographs clearly showed differences of the K_α line from diamond on one hand and graphite on the other hand. The graphite line is unsymmetric and the center of the intensity distribution is shifted towards the short wave range. EF (5b)

Do Change of Lattice Constants During Formation of Solid Solutions Depend on Grain Size? (Hängt die Änderung der Gitterkonstanten bei Mischkristallbildung von der Korngrösse ab?) E. Schmid & G. Siebel. *Metallwirtschaft,* Vol. 11, Dec. 16, 1932, page 685. According to results obtained by P. Wiest on Ag-Cu alloys, lattice enlargement apparently depends on grain size and differs between single crystals and polycrystalline samples. Difference in solubility of Ag would also result. Authors' experiments with Al-Mg, Zn-Mg, Mg-Al, and Cu-Al alloys proved that there was no difference in lattice changes between single and polycrystals. Tests were then made on Ag-Cu alloys and same results were obtained. 4 references. CEM (5b)

The Determination of the Solubility of Manganese in Magnesium by X-Rays. (Röntgenographische Bestimmung der Löslichkeit von Mangan in Magnesium.) E. Schmid & G. Siebel. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 21-23. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 296. (5b)

Sodium-Lead Alloys. The Structure of the Compound Known as Na_4Pb. Charles W. Stillwell & Walter K. Robinson. *Journal American Chemical Society,* Vol. 55, Jan. 1933, pages 127-129. Diffraction data for compound usually designated as Na_4Pb have been analyzed. Analysis indicates that structure of this compound is face-centered cubic, with 78 atoms in unit cell. It is apparently analogous to familiar γ-phase of Cu, Ag and Au alloyed and its more exact formula is therefore $Na_{31}Pb_8$. MEH (5b)

Eutectic Decomposition of Tin Bronzes. Preliminary Report. (Über den eutectischen Zerfall der Zinn-Bronzen. Vorläufige Mitteilung.) J. Jsaitschew & G. Kurdjumow. *Metallwirtschaft,* Vol. 11, Oct. 7, 1932, page 554. Decomposition of β phase of alloy 24% Sn, 76% Cu was investigated. Lattice which forms when polycrystalline alloy is quenched is similar to martensitic β′ lattice of Al bronzes. When a β single crystal is quenched β phase can be completely suppressed so that it is impossible to determine orientation of new lattice. Transformation of β single crystals during annealing was studied and orientation of resulting α and γ phases determined by means of their pole figures. α and γ phases have a crystallographic relation to axes of original β single crystals. 2 references. CEM (5b)

A Gamma Ray Ionization Chamber. Geo. C. Laurence. *Canadian Journal of Research,* Vol. 7, July 1932, pages 103-107. In an article accompanied by 2 illustrations the author describes a γ ray ionization chamber with an accessory electrometer box, the apparatus being suitable for precision measurements of radioactive preparations and for the determination of the absorption coefficient and specific ionizing powers in air of γ rays. OWE (5b)

The Crystal Structure of Gallium. (Kristallstruktur des Galliums.) F. Laves. *Die Naturwissenschaften,* Vol. 20, June 17, 1932, page 472. Tetragonal symmetry formerly found by Jaeger (*Zeitschrift für Kristallographie,* Vol. 66, Dec. 1927, page 195) could not be confirmed. A pseudo-tetragonal, rhombic holohedric symmetry with one-sided face centered translation group was established. EF (5b)

Crystallographic Treatment of Single Crystals in Wire or Rod Form. (Zur kristallographischen Behandlung des draht-oder stabförmigen Einkristalls.) J. Leonhardt. *Metallwirtschaft,* Vol. 11, Dec. 2, 1932, pages 659-662. Method devised by author is described for projecting crystallographic structure of single crystal in wire or rod form on a plane for study of its properties. It is called central cylinder projection. This method is considerably simpler than previous ones in use and gives more information in a relatively short time. To demonstrate application of this method projection of a W single crystal rod which had been etched is carried out. CEM (5b)

The Lattice Constants of Cu-Pd Solid Solutions. (Die Gitterkonstanten der Cu-Pd Mischkristalle.) J. O. Linde. *Annalen der Physik,* Series 5, Vol. 15, Nov. 1932, pages 249-251. Values for statistical and ordered distribution in constitutional diagram from 0-100% Pd are determined. Cu-Pd alloys form a continuous series of solid solutions. Ha (5b)

Defects in Microstructure of Cast Iron Determined by Debye-Scherrer Diagrams. (Bestimmung von Gusseisen-Feinstrukturfehlern durch Debye-Scherrer Diagramme.) H. Reininger. *Maschinenbau,* Vol. 11, Nov. 3, 1932, pages 443-445. Difficulty in evaluating defects of microstructure of cast Fe by X-ray photographs was partially removed by comparing with photographs of sound material and of any possibly existing defects such as Fe_3O_4, etc. By comparison, cause of any defect is indicated. Limits of application are shown and some applications of method given. RFV (5b)

The Beta Transformation in Copper-Zinc and Silver-Zinc Alloys. (Ueber die Beta Umwandlung in Kupfer-Zink und Silber-Zinklegierungen. I.) M. STRAUMANIS & J. WEERTS. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 23-26. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 241. (5b)

Equipment for Studying Inner Quality of Welds. J. R. TOWNSEND. *Metal Progress,* Vol. 21, June 1932, pages 42-44. Description of weld testing and research laboratory of Bell Telephone Co. Facilities include automatic, semi-automatic and hand welding equipment, oxyacetylene gas welding and cutting equipment, automatic H welding apparatus, and an X-ray machine capable of examining welds of parts up to 3" thick. Tube operates at 200,000 volts and 5 milliamps. WLC (5b)

Structure of Rolled Zinc. (Bemerkungen zur Walztextur von Zink.) M. A. VALOUCH. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 64-68. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 241. (5b)

Thermodynamic Properties of Solid Solutions of Gold and Silver. A. WACHTER. *Journal American Chemical Society,* Vol. 54, Dec. 1932, pages 4609-4617. Energy changes of solid Ag upon dilution with Au have been determined at mol fractions of Ag varying from 1.0 to 0.150, between temperatures of 200 and 400° C. Solid solution containing 0.5 mol Ag is shown to be most stable. MEH (5b)

A Heating Arrangement for X-Ray Samples. (Ueber eine Heizvorrichtung für Röntgenpräparate). G. WASSERMANN. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, page 69. See *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 267. (5b)

The Transformation of Cobalt. (Ueber die Umwandlung der Kobalts.) G. WASSERMANN. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 33-38. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 296. (5b)

The Transformation Process in β Brass and in β Ag-Zn Alloys. (Über Umwandlungsvorgänge im β-Messing und in β-Silber-Zinklegierungen.) J. WEERTS. *Zeitschrift für Metallkunde,* Vol. 24, Nov. 1932, pages 265-270. Precipitation of α phase from β in Cu-Zn alloys upon quenching and reheating to moderate temperatures leads to formation of 6 sets of plates of α phase within each β grain. These plates are parallel to $\{110\}$ planes in β phase. X-ray analysis shows that $\{111\}$ planes in α plates are parallel to plane of α plates and thus to $\{110\}$ planes in β phase, and that a [110] direction lying in each α plate surface is parallel to a [111] direction lying in $\{110\}$ plane in β phase. This atomic transformation is thus identical (though reversed) to that found in martensitic decomposition of austenite in Fe-C alloys (*Naturwissenschaften,* Vol. 18, 1930, page 534). Quenched β alloys in Ag-Zn system show formation of a new phase, zeta, of hexagonal symmetry, and of a β' phase similar in structure to β but with regular atom distribution. X-ray and photomicrographical evidence are given for these changes. The changes in hardness and electrical resistance which accompany these changes are shown in diagrams. Course of changes conforms to analysis proposed by v. Göler and Sachs (*Zeitschrift für Physik,* Vol. 77, 1932, pages 281-286). Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. RFM (5b)

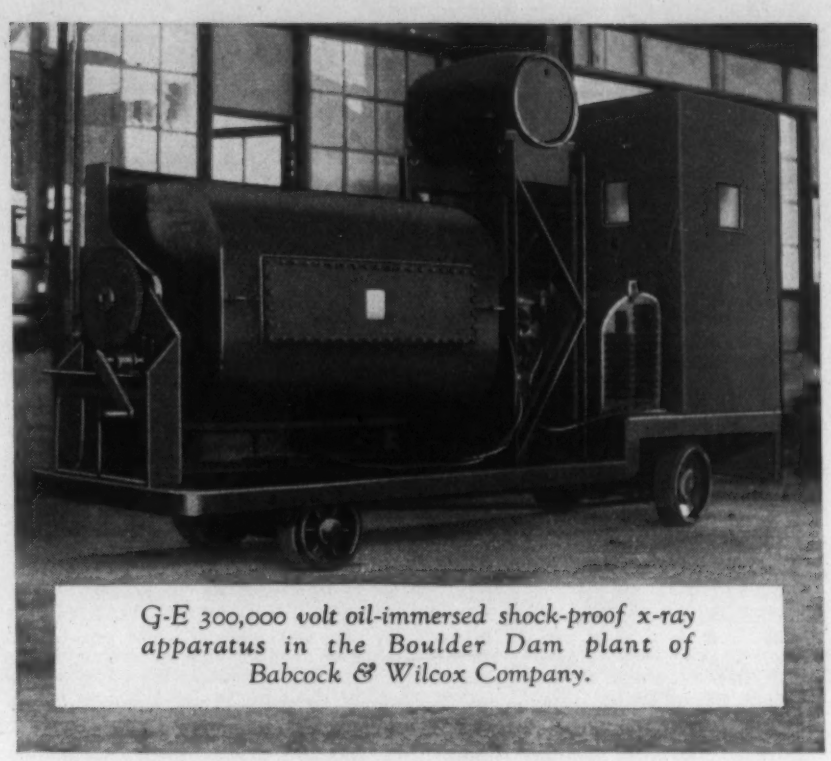
Crystal Structure of Cementite. (Cementitens kristallstruktur.) A. WESTGREN. *Jernkontorets Annaler,* Vol. 114, Oct. 1932, pages 457-468. Grouping of Fe atoms suggested by Hendricks (*Zeitschrift für Kristallographic,* Vol. 74, 1930, 534) is verified but parameters have been slightly adjusted as follows: $x = 0.333$, $y = 0.175$, $z = 0.065$ and $u = -0.167$, $v = 0.04$. C atoms are surrounded by 6 Fe atoms at distance 2.01 A. U., which define a regular prism on a triangular isosceles base. 11 references. HCD (5b)

On Precision Measurements of Lattice Constants. (Ueber Präzisionsmessungen von Gitterkonstanten.) FRANZ WEVER & OTTO LOHRMAN. *Mitteilungen aus dem Kaiser-Wilhelm Institut für Eisenforschung,* Vol. 14, No. 10, Report 206, 1932, pages 137-150. Doctor's thesis on methods of precision measurement with the Debye-Scherrer camera. Single emulsion X-ray films are used, read by a comparator with microscope (1 to 5 diameters). Reading to middle of lines is preferred to reading either edge. Calibration of cameras by a comparison spectrum is unsatisfactory because of variable film shrinkage—a better method is a comparison spectrum on each film. Errors due to finite specimen diameter may be minimized by using small specimens or large cameras, or corrections for specimen diameter may be applied by various formulas (Hadding, Ott, Pauli, Bijl and Kolkmeijer, Kolkmeijer, Busse, Goldschmidt and Thomassen, Holgersson and Sendström, Holgersson). Several of these formulas are applied to test films to determine their relative effectiveness. A modification of Kettman's method of extrapolating to $\theta = 90°$ is also tried. Graphical interpolation on a correction curve plotted from a comparison spectrum gave good results. A new method of interpolation is presented: the unknown function $\theta = f(2l_0)$ that gives dependence of diffraction angle upon measured line spacings is replaced by a function which can be interpolated by formula of Lagrange. An accuracy is obtained by this method of about 0.0003 A.U.-0.0006 A.U. or 0.01-0.02%. Hadding method of correcting for finite specimen diameter gives an accuracy slightly less, as does graphical interpolation (about 0.03%). Method of interpolation by formula of Lagrange has disadvantages that extrapolation beyond range covered by comparison lines is impossible (with specimen diameter correction formulas whole range of angles may be used) and that errors in measurement of distance between comparison lines and neighboring specimen lines strongly affect the results. CSB (5b)

The Free Energy of Transition of Iron ($\alpha \rightleftarrows \gamma$). YAP, CHU-PHAY. *Transactions Faraday Society,* Vol. 28, Nov. 1932, pages 781-788. Assumption is made that specific heat values for Fe as obtained from published sources are correct and that specific heat of γ Fe at temperatures lower than 900° C. is the following continuous linear function: γ Fe; Sp. Ht. $= 0.1069 + 4.403 \times 10^{-5}$ T cal./g. The variation in the heat of transition, $\alpha \rightarrow \gamma$, is calculated by Kirchhoff's law. By plotting Cp/T against T and taking the area under the curve the relative entropy between any two temperatures of α and γ Fe are obtained; by adding 6.87 cal./g. atom, the absolute entropy of Fe from 0° to 25° C., to the relative entropy of α iron, its absolute entropy is obtained; 0.14252 cal./g. was used for getting absolute entropy of γ iron. Using the equation $\Delta F = \Delta H - T\Delta S$ the following was obtained as free energy change of transition (ΔF) $\alpha \rightarrow \gamma$ at various temperatures 25° C. = 822 cal./g. atom; 200° C. = 594; 600° C. = 206; 900° C. = 0; 1000° C. = —19; 1200° C. = —25; 1400° C. = 0. Some discussion on the phenomenon of reversible polymorphism and on the possibility of non-allotropy of Fe was included. Short bibliography. PRK (5b)

The Free Energy, Entropy and Heat for Formation of Iron Carbide Fe_3C. YAP, CHU-PHAY & C. L. LIU. *Transactions Faraday Society,* Vol. 28, Nov. 1932, pages 788-797. Thermal data on the formation of Fe_3C were obtained: $3\alpha Fe + C \rightleftharpoons Fe_3C$; $\Delta F°_{298} = 9300$ cal./mol.; $\Delta H_{298} = 12{,}300$ cal./mol.; $\Delta S_{298} = 9.9$ cal./mol.; $S_{298} = 31.8$ cal./mol. From its free energy of formation, Fe_3C is stable above 750° C. The theory of CH_4/H_2 and CO/CO_2 equilibria with austenite solid solution and Fe_3C., was discussed and a very simple graphical method of obtaining the CO_2/CO constants at high temperatures was presented. There are good reasons for believing that at high temperatures many metallic solutions are ideal from the standpoint of Raoult's Law. PRK (5b)

Magnetic Spectrum of β-Rays from Thorium B. (Sur le spectre magnetique des rayons β emis par le thorium B.) SZE SHIH-YUAN. *Comptes Rendus,* Vol. 194, Mar. 7, 1932, pages 874-876. To avoid difficulty of continuous spectrum which prevents recognition of weak lines, a comparatively large apparatus constructed of a light metal is used, and dimensions of radioactive source are reduced. Tables are given for β-ray spectral lines of thorium B, and an analysis of associated γ-rays is made. OWE (5b)



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PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

Fatigue of Metals & Alloys (6f)

The abstracts appearing under this heading are prepared in co-operation with the A.S.T.M. Research Committee on Fatigue of Metals.

A Machine for Determining the Fatigue Limit of Metals. WALTHER SARAN. *Engineering*, Vol. 133, June 24, 1932, pages 731-734. Describes machine on which both static and dynamic tests can be made thus eliminating errors caused by using 2 different machines. The machine was so designed by the author and manufactured by Messrs. Carl Schenck, G. m. b. H. of Darmstadt that it will generate pure sinusoidal stress. Load can be kept absolutely constant for any desired length of time once test piece is in position. Stress can be altered during operation progressively and precisely through a given range. Stress, strain-energy and temperature of test piece can be measured accurately as the load increases. It is possible to keep the test piece cool while the machine can be run continuously without supervision and it stops automatically when the test piece breaks. The number of load reversals are measured automatically and a given static stress can be imposed on the dynamic stresses. Tests can also be carried out at high temperatures making it possible to carry out pure static tests. Method of operation is explained in detail. LFM (6f)

Observations on the Determination of the Endurance Limit and the Permissible Strain of Materials (Einige Bemerkungen über die Ermittlung der Dauerfestigkeit und der zulässigen Anstrengungen der Werkstoffe). O. GRAF. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 328-333. Brief comments on tests of materials with flaws at the surface, and on welded and riveted materials. 9 references. HWG (6f)

What Is this Thing Called Fatigue? H. W. GILLETT. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 71-79. Describes characteristics of fatigue failure and cites a number of illustrations. Work of various investigators and effects of various factors in tests are discussed. Types of machines used for fatigue testing are described and work being done at various laboratories on the subject is discussed. Properties of many materials under fatigue conditions are given. Introduction of corrosion into the problem is discussed. WLC (6f)

The Fatigue Resistance of Unmachined Forged Steels. G. A. HANKINS & M. L. BECKER. *Iron & Steel Institute, Advance Copy* No. 5, Sept. 1932, 17 pages. Rotating-bending tests were made on forged-unmachined and on forged-machined-polished specimens. The steels tested were: 0.20% C normalized, 0.40% C oil quenched and tempered, 3% Ni oil quenched and tempered, and Ni-Cr oil quenched and tempered. The values of tensile strength and endurance limit in tons/in.^{2} were:

		Tensile Strength	Endurance Limit Machined	Endurance Limit Unmachined
0.20% C	A	30	14.2	12.1
	B	33	14.7	11.7
0.40% C	A	45	21.0	16.5
	B	41	21.6	12.7
3% Ni	A	59	32.5	15.0
	B	52	27.9	15.8
Ni-Cr	A	66	31.5	18.0
	B	60	31.0	14.4

Lots A and B were furnished by different plants. Microscopic examination of reheated specimens indicated that the low endurance limits of the high-strength steels in the unmachined condition were due to decarburization. Tests on mild cold-rolled steel gave endurance limits of 15.7 and 14.5 tons/in.^{2} respectively for polished and unmachined specimens. Detailed data of the tests are given in an appendix. JLG (6f)

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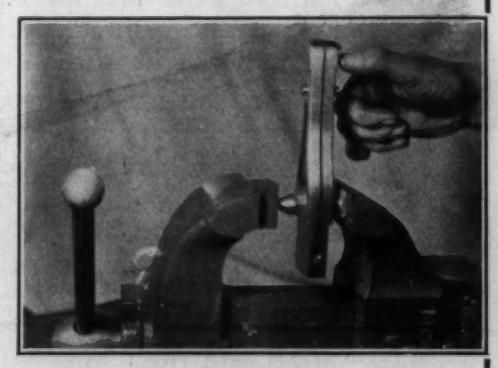

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Light Metal Sand Castings. Their Static and Dynamic Strength. (Leichtmetall-Sandguss, seine statische und seine Schwingungs-Festigkeit.) W. SARAN. *Zeitschrift für Metallkunde*, Vol. 24, Aug. 1932, pages 181-184. The following alloys were studied: "German alloy" (Al with 12% Zn, 2% Cu). "American alloy" (Al with 0.28% Zn, 5.78% Cu, 0.47% Si, 0.08% Mg), piston alloy (Al with 14.4% Cu. silumin (unmodified). R-S-Seewasser. Lautal, Alufont (Al with 12% Zn, 2% Cu, 1.5% Fe, 0.24% Mg), and Elektron. Data are given in tables and graphs for these alloys, both in the "as cast" and the age-hardened condition for: Brinell hardness, the 0.001%, 0.01%, and 0.2% elongation yield points—together with the stress-strain curves within this range, similar data for bending and torsion, the tensile strength, the elastic moduli in tension and rigidity, and for fatigue in pressure-tension at a frequency of 30,000 alternations/min. RFM (6f)

Cable Testing. (Ein Beitrag zur Fördersellprüfung.) ERNST FRANKE. *Internationale Bergwirtschaft und Bergtechnik*, Vol. 25, Aug. 15, 1932, pages 106-109. After a brief survey on the present methods of cable testing, the importance of endurance tests is emphasized and the new endurance cable testing machine of Woernle described. Suggestions for rope testing are made. It is shown how results are evaluated with the aid of the principles of statistics. GN (6f)

The Determination of the Elastic Modulus of Rods by Means of Bending Alternations. (Ueber die Bestimmung des Elastizitäts moduls von Stäben mit Hilfe von Biegungsschwingungen.) E. GOENS. *Annalen der Physik*, Series 5, Vol. 11, Nov. 1931, pages 649-678. The theory of the bending alternations of a rod suspended from 2 nodal points by means of threads so as to leave both ends free is discussed, and it is shown how to calculate the modulus of elasticity from its specific frequency which is measured by comparing the note of the vibrating rod with that emitted by an electrically operated tuning fork, the current actuating which is varied until its frequency is the same as that of the rod, i.e. until no surgings can be observed. Results obtained with rods of different materials and with different dimensions show a good agreement between theory and experiment. By means of a tube sound emitter frequencies of over 10,000 cycles can be measured very conveniently. Ha (6f)

Some Effects of Corrosion Fatigue on Streamline Wire for Aircraft. HUGH E. HAVEN. *Transactions American Society of Mechanical Engineers*, Vol. 4, July-Sept. 1932, Aeronautical Engineering, pages 109-115. An experimental investigation was begun on the fatigue stresses of the streamline wires of approximately elliptical section used in the construction of tension members of aircraft. Tests and formulas for the determination of vibration stresses, tension stresses under the simultaneous influence of corrosion are described. No definite conclusions can yet be drawn. The tests are being continued. Ha (6f)

Understressing and Notch Sensitiveness in Fatigue. J. B. KOMMERS. *Engineering News-Record*, Vol. 109, Sept. 22, 1932, pages 353-355. Experiments have shown that repeated understressing may strengthen material as much as 1/3. This "coaxing" effect is greatest when the initial stressing is close to the endurance limit and may be increased by progressive raising of the stress. Experiments on notch effect show that notches were more harmful in specimens of ductile steel than in specimens of brittle cast Fe. CBJ (6f)

Fractures of Aluminum Transmission Lines by Swinging and Means of Prevention. (Schäden an Aluminiumleitungen durch Seilschwingungen und Mittel für ihre Behebung.) G. LEHMANN. *Elektrizitätswirtschaft*, Vol. 30, Sept. 1931, pages 530-533. An investigation on a 2100 kilovolt overhead line of Al rope (37 wires of 150 mm.^{2} cross section) suspended with 250 m. span, proved that failure in service was due to fatigue produced by swinging. The elimination of the source of trouble mainly by suspension clamps which do not reflect the vibration but permit them to pass, is discussed at length. In laboratory tests, which employed the new clamping device, no fracture occurred after even 60 million oscillations, while the Al cables failed in service after 2 million oscillations. EF (6f)

Atmospheric Action as a Factor in Fatigue of Metals. H. J. GOUGH & D. G. SOPWITH. *Institute of Metals, Advance Copy* No. 611, Sept. 1932, 20 pages. The materials tested included some commonly used in airplane construction and some especially selected for their uniform properties. The former group contained a 0.5% C cold-drawn steel, 15% Cr steel, 18 Cr-8 Ni steel, 17 Cr-1 Ni steel, a structural Ni-Cr steel, Duralumin, and a Mg alloy. The especially uniform materials were a 0.13% C steel, Cu, 70-30 brass, and 80-20 Cu-Ni. Cantilever tests of carefully cleaned specimens and specimens coated with lanoline grease indicated that the grease did not affect the fatigue limit. Other tests were made with the "Haigh" electro-magnetic testing machine, which produces alternating axial stresses. Specimens were tested as carefully cleaned, covered with lanoline, and in a vacuum. To test in a vacuum the sample was surrounded by a Sylphon bellows, which was evacuated to a pressure of from 0.0005″ to 0.001″ of Hg by means of a "Cenco Hyvac." The clean specimens and those covered with lanoline had the same endurance properties. Materials stressed in vacuum had a higher endurance limit than those tested in air. The vacuum increased the endurance limit of 0.13% C steel by about 5%, of Cu by 13%, and 70-30 brass by 26%. Pains were taken to make certain that the increased endurance limit was really due to the vacuum. The significance of the results with respect to interpretation of corrosion-fatigue data is discussed. An appendix gives temperature measurements of the samples during test, which indicate that the observed effects were not due to differences in temperature between the specimens tested in air and in vacuum. 6 references. JLG (6f)

Increase of Endurance Strength of Round Bars with Cross Holes. (Steigerung der Dauerfestigkeit bei Rundstäben mit Querbohrungen.) UDE. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Apr. 2, 1932, page 348. Endurance strength of rods of 10 mm. diameter with cross holes of different sizes showed a minimum strength at a ratio of circumference/diameter = 0.15. The fatigue test gave 13.4 kg./mm.^{2} This value could be increased by providing another hole of equal diameter vertical to the first, which produced an equalization of the varying stress in rotation; improvement was 4.5%. If 2 "relief notches" were provided near the edge of the hole, an improvement of 12% was observed. The possibilities of producing such artificial stresses and relief methods are discussed at some length. In connection with this work of Ude's attention is called to the work of Thum and Oschatz abstracted below. Attention is also called to the photoelastic studies of Frocht (*Transactions American Society of Mechanical Engineers*, Vol. 54, 1932, page 83) which showed that a proper spacing of notches might be made to reduce the stress below that developed at a single notch, and to the work of R. R. Moore (*Proceedings American Society for Testing Materials*, Vol. 26, Part II, 1926, page 225) which showed that the fatigue strength of a test specimen on which a screw thread had been cut was greater than the fatigue strength of a specimen with a single notch of the same shape as the screw thread. Ha (6f)

Regularities of the Path of the Endurance Fracture. (Gesetzmässigkeiten des Dauerbruchweges.) A. THUM & H. OSCHATZ. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Feb. 6, 1932, pages 132-134. The path of endurance fracture indicates for all types of stresses a very close connection with the fields of force which were effective in fractured samples. Fields of isotenses (lines of tension) are determined and represented by diaphragm method of Prandtl and method of Hele-Shaw for cross and longitudinal sections and compared with actual fractures. In this way the law was found that the endurance fracture occurs on the equipotential plane to the tension lines. By changing the conditions of the edges the path can be influenced. This fact can be made use of very advantageously by arranging additional notches or similar dents to make the endurance fracture a more remote danger. Examples explain method. 5 references. See preceding abstract. Ha (6f)

ELECTRO-CHEMISTRY (7)

Electroplating (7a)

The Importance of Current Density in Chromium Plating. (Die Bedeutung der Stromdichte für die Verchromung.) H. KURREIN. *Oberflächentechnik,* Vol. 9, Aug. 16, 1932, pages 165-166. The range in which a high-gloss Cr deposit can be obtained depends greatly on concentration and temperature of the bath. For instance, in a bath of 250 g. CrO_3/l. this range is at 40° C. from 4-9 amp./dm.^{2} at 45° from 6-15 amp./dm.^{2}, at 50° C. from 8-23 amp./dm.^{2}; on the other hand, at 25° C., the range for 250 g./l. lies at 3-8, 400 g./l. at 3.5-9, for 350 g./l. 3.8-10 amp./dm.^{2} The shape of the object to be plated must also be such that not too great a difference in the ohmic resistance of the current paths is produced which results in an ununiform deposit. Ha (7a)

Rubber and its Application in the Plating Industry. NELSON H. NORRIS. *Rubber Age,* Vol. 31, Aug. 10, 1932, pages 357-358. It is pointed out how considerable savings can be made by the use of rubber insulated racks and other rubber devices for electroplating; savings in metal, electrical energy by directing the current only to the ware where needed, in time due to quicker hanging the wares and cleaner racks and in greatly reduced maintenance. Ha (7a)

Investigations of Denickeling Baths. (Untersuchungen über Entnickelungsbäder.) H. KRAUSE. *Oberflächentechnik,* Vol. 9, Sept. 6, 1932, pages 179-181; Sept. 20, 1932, pages 191-193. Removal of old or defective Ni plating is often necessary. The most used denickeling bath and that which is easiest to control without undue attack of the base metal is a H_2SO_4 solution of 53° Be; the current should be about 2 amp./dm.^{2} The presence of As is to be avoided as this will strongly attack the base metal and also impairs the health of the operators. Investigations were made to determine the influence of various H_2SO_4 concentrations, action on different base metals and different current densities. The action of H_2SO_4 could not be improved by any addition. Ha (7a)

Zinc Electro-Deposition. *Engineering,* Vol. 134, Aug. 26, 1932, pages 253-254. In the electrodeposition of Zn from ore solutions, chemical Pb anodes are used and the cathode starting sheets are made of Al. To produce pure, dense deposits, the electrolyte should contain from 3 to 8% Zn. A small amount of glue or gelatine improves the smoothness of the deposit. Discusses tank equipment, deposition and nature of the deposit. LFM (7a)

Improvement in the Deposition of Electrolytic Coatings on Aluminum by a Pretreatment by the Eloxal Process. (Verbesserung in der Aufbringung galvanischer Ueberzüge auf Aluminium durch eine Vorbehandlung nach dem Eloxalverfahren.) *Aluminium, Hauszeitschrift V. A. W. und Erftwerk,* Vol. 4, Apr.-June 1932, page 111. A method is briefly described which produces easily and from normal electrolytes, firmly adhering metal coatings of other metals on Al which has a thin Eloxal film on it. Ha (7a)

The Nickel Electrolyte and its Significance with Reference to the Nickel Anode. (Der Nickelelektrolyt und seine Bedeutung für die Nickelanode.) H. K. WORK. *Metallwaren Industrie und Galvanotechnik,* Vol. 29, Aug. 1, 1931, pages 333-334. The electrolyte must be adapted to the anode. Increasing solubility of the anode requires increasing current densities. The best service is rendered by hammered anodes of purest Ni. EF (7a)

Nickel Baths and Lead Lining. (Nickelbäder und Bleiauskleidung.) *Oberflächentechnik,* Vol. 9, Aug. 16, 1932, pages 166-167. It has been observed that large and irregular objects get a better Ni deposit in a wooden tank than in one lined with Pb. This is due to the Pb lining which might become part of the current path if the distance anode $\rightarrow$ Pb + Pb $\rightarrow$ object is considerably smaller than the direct distance anode $\rightarrow$ object. The screening of a Pb wall by glass has often proved a good means to eliminate such occurrence, but the Pb bottom must also be protected in the same way. The chemical conditions are discussed more in detail. Ha (7a)

Anodes in Chromium Plating Baths. (Anoden in Verchromungsbädern.) H. RUETTERMANN. *Oberflächentechnik,* Vol. 9, Aug. 16, 1932, page 168. Attention is called to a new anode for Cr plating which has not the disagreeable feature of other Pb anodes of having to be cleaned every so often from the Pb chromate which takes much time and is poisonous. No details of the material of the electrode are given except that it is made by J. B. O. Stamm & Hoppe, Solingen, under the name of IBO-Active; it is said to have a 100% anodic current efficiency. Ha (7a)

Pretreatment of Alloyed Materials for Electroplating. (Vorbehandlung von legierten Stoffen zur Galvanisierung.) P. STEEN & R. LEONHARDT. *Oberflächentechnik,* Vol. 9, Aug. 2, 1932, pages 157-158. The reasons for the different behavior of alloys in electroplating are discussed and explained by the electrical behavior of the metals towards one another. A classification of materials according to the defects developed after plating is made and it is shown that the durability of a coating depends in the first place on the cleanliness of the treated surfaces. Ha (7a)

Chromium Plating. E. S. RICHARDS. J. B. Lippincott Co., Philadelphia, 1932. Cloth, 5¼x7¾ inches, 131 pages. Price $3.50. In the foreword and preface, it is explained that this book is written for the practical plater, and that "chemical and theoretical considerations are not given a great deal of space." The author has given a clear, simple description of British practice in the preparation and plating of metals with Cr, including the customary preliminary plating with Cu and Ni. A practical plater can get many valuable suggestions on details such as the wiring or racking of articles for plating. The book is fairly free from typographical errors, but in several places on pages 66 and 67, "bisulphite" is spelled "bisulphate."

An American reader will find that English practice is not greatly different from American. Without specific references, the author gives credit to America for the commercial development of Cr plating about 1925. More frequent mention is made of French practice than of American, but no literature references are given on any subject. In reading this book, an American should remember that the concentrations are presumably given in terms of the Imperial gallon, which is about 20% larger than the U. S. gallon. Even with this correction, the concentrations of the cleaning solutions (page 60) seem unduly high (about 2.5 lbs. of alkali per U. S. gallon); and the formula for a Ni solution (page 75) includes a concentration of the double Ni salt that far exceeds its solubility.

When the author touches on scientific aspects, he is less clear or reliable. On page 69, in an explanation of the "burning" of deposits on the edges, he illustrates by a diagram the passage of current from anode to anode when no cathodes are in solution, and when obviously no current could pass! The explanation of pH on page 72 is clear, but almost no use is made of it in describing Ni plating. For example on the next page the author refers to "the addition of half a pint or so of H_2SO_4, according to the size of the vat." No mention is made of the low pH solutions recently developed in this country. No methods are given for measuring pH, or in fact for any chemical tests or analyses.

This book may no doubt be of some service to many practical platers in both England and America. It will not, however, meet the desires of those progressive platers in both countries who wish to know not only *how* but *why* various operations are carried out. William Blum (7a) -B-

Electrolytic Rhodium, Platinum and Palladium Deposits. (Elektrolytische Rhodium-, Platin- und Palladium-Niederschläge.) PAUL HAAS. *Oberflächentechnik,* Vol. 9, July 19, 1932, pages 148-149. The deposition of Pt, Pd and particularly Rh on Ag wares is recommended as effective means for preventing tarnish. Ready made solutions in salt form easily dissolved in water are prepared by Heraeus. The deposits are white and have bright polish. Solutions are not poisonous. Ha (7a)

Cadmium Plating of Iron and Steel. (Die Verkadmierung von Eisen- und Stahlmaterialien.) R. THEWS. *Die Metallbörse,* Vol. 22, Feb. 20, 1932, pages 226-227; Feb. 27, 1932, page 259. The replacement of Zn by Cd as plating material is based on the following facts: Cd adheres more firmly to the metallic carrier, a thinner Cd layer can be secured, low tendency toward flaking off and greater resistance toward alkalies and towards a number of acids on the part of the Cd-platings. The atmospheric corrosion, however, is less pronounced on galvanized material. A careful treatment preceding the plating process is stressed. Dipping into hot K_2CO_3 solution, cleansing and dipping into 10% HCl is recommended. Occasionally a NaCN solution (25 g. NaCN/l.) or a cathodic treatment in an alkaline solution is required to get rid of the contaminations at the surface. Two Cd-baths used in Germany are given: (1) 20 g./l. Cd $(OH)_2$, 40-42 g./l. NaCN, 3-6 g./l. NaOH, 2-3 g./l. Na_2CO_3, 6 g./l. NH_4OH; (2) 25-50 g./l. Cd $(OH)_2$, 38 g./l. $(NH_4)_2SO_4$, 104 g./l. NaCN, 15 g./l. NaOH. The addition of sulphide cellulose residues (8-12 g./l.) and Turkey Red Oil (10-12 g./l.) are mentioned. The quantity of the decomposed NaCN should be checked daily. One analysis per week for NaOH suffices. The electrolyte should be filtered once a week and Na_2CO_3 must be frozen out if the content passes 100 g./l. The electric data are stated as follows: voltage = 4-6 volts; current density = 3-3.5 amps./dm.^{2}; time for light Cd-plating = 30 min.; heavy plating = one hour; ratio between anode and cathode surface = 1.5 : 1. The plated material is cleaned successively with cold water, 4-5% acetic acid solution and hot water (below 50°C.). The author warns against the use of Cd as intermediate layer for Ni-plating. EF (7a)

Intermediate Layers in Chromium Plating. (Zwischenschichten in der Chrom Galvanotechnik.) R. JUSTH. *Metallwaren Industrie und Galvano-Technik,* Vol. 29, Oct. 1, 1931, pages 436-437. In bicycle manufacture, Ni plating with intermediate layers of Cu are generally adopted. The combinations Zn-Ni and Cd-Ni did not turn out favorably. EF (7a)

Note on the Diffusion of Electrolytic Cadmium. (Notiz über das Einsinken elektrolytischer Cadmiumneiderschläge.) ERNST BEUTEL & ARTUR KUTZELNIGG. *Zeitschrift für Elektrochemie,* Vol. 37, Dec. 1931, page 886. Stamped brass was plated with Cd from a cyanide bath. After 12 hrs. the white deposit had taken on a yellow hue, and in 3 months spots were completely yellow, on account of the diffusion of Cd into the brass. This phenomenon was not observed when the Cd was deposited from a H_2SiF_6 solution, perhaps because of the larger grain size. 3 references. Ha (7a)

Practical Chromium Plating. (Praktische Verchromung.) R. APPEL & H. LEISER. *Metallwaren Industrie und Galvanotechnik,* Vol. 29, May 15, 1931, pages 216-217. According to the authors, Cr baths with more than 1.2% H_2SO_4 referred to CrO_3 also yield good results. EF (7a)

Durable, Bright Chromium Finish now Assured by Proper Processing. JOSEPH GESCHELIN. *Automotive Industries,* Vol. 66, Mar. 1932, pages 481-484. A discussion of the following points: (1) Difficulties in Ni plating; (2) consideration of difficult base metals; (3) corrosion resistance; (4) polishing materials and methods; (5) patent situation. Recent research work shows how shortcuts and lack of control play havoc in automobile parts plating. Recommendations as developed by leading investigators will enable platers to achieve lasting finishes. DTR (7a)

Adhesion of Electroplated Coatings. W. BLUM. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 57-59. Adhesion of electroplate to the base metal is elusive of measurement. Deformation of the base metal and observation of the action of the plate is attained by bending sheet metal or subjecting to an Erichsen test. Other methods have been tried but none yield real information regarding relative adherence. The major factors affecting adherence are the properties of the boundary and of the coating. A boundary zone rather than line is to be desired. A very thin film of grease or similar material is sufficient to prevent any adherence. Importance and methods of cleaning are discussed. The condition of strain in the metal coating and its relation to adherence is discussed. Such factors as metal and metal ion concentration, current density, agitation, and temperature are discussed as they affect the ductility and adherence of the coating. Thin coatings of Cr adhere better than thick. 9 references. WLC (7a)

Electro-plating on Aluminum. (Die galvanische Behandlung von Aluminium.) J. FISCHER. *Metallwirtschaft,* Vol. 11, Aug. 26, 1932, pages 473-474. A description is given of the better known methods of etching Al parts in acid and alkaline solutions and of several Ni and Cd plating solutions. A new method of plating Al consists of first forming an oxide surface by treating in a CrO_3 solution for a few minutes at 60 V., d.c., or better in a soda solution with a.c. The Al is then transferred to an alkaline solution containing Cu or brass and treated cathodically which partly reduces the oxide coating and simultaneously deposits a thin layer of Cu or brass. The parts are then plated in a Ni, Cu or Cd solution in the regular way. Coatings deposited by this method have exceptional adhesion and toughness and withstand severe bending and hammering. 14 references. CEM (7a)

Chromium Plating of Pure Aluminum and Aluminum Alloys. (Das Verchromen von Reinaluminium und Aluminiumlegierungen.) K. ALTMANNSBERGER. *Metallwaren Industrie und Galvano-Technik,* Vol. 29, Nov. 15, 1931, pages 501-502. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 245. EF (7a)

High Capacity Nickel Baths. (Hochleistungsnickelbäder.) K. ALTMANNSBERGER. *Metallwaren Industrie und Galvano-Technik,* Vol. 29, Oct. 15, 1931, pages 457-458. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 306. EF (7a)

Experiments to produce a Flawless Chromium Plate of Lasting Thickness. (Versuche zur Herstellung riss- und porenfreier Chromniederschläge in ausreichender Stärke.) P. HENTSCHEL. *Metallwaren Industrie und Galvano-Technik,* Vol. 29, Dec. 1, 1931, pages 525-526. In a Cr plating bath of the Krämer & Kleinschroth Co., which applies a current density of 1-5 amps./dm.^{2} and 3.2-3.6 volts, absolutely flawless deposits were secured due to the lower hydrogen development and to the high throwing power. No flaws could be noticed under the microscope on Cr platings even after the brass carrier had been completely dissolved in concentrated HNO_3. Cr plates deposited at a current density greater than 6 amps./dm.^{2} however disintegrated in concentrated HNO_3. EF (7a)

Plating Before Forming. J. S. HOFFMAN, *American Machinist,* Vol. 76, June 16, 1932, page 755. Cd plating of condenser plates of different types is done economically before bending to proper shape. Material and deposit are ductile enough to withstand severe bending without breaking the continuous corrosion-resistant coating. Ha (7a)

Experimental Results on Flawless Chromium Deposits Secured with the "Kr" Chromium Plating Bath. (Untersuchungsergebniss über riss- und porenfreie Chromniederschläge hergestellt in dem "Kr" Verchromungsbad.) P. HENTSCHEL. *Metallwaren Industrie und Galvano-Technik,* Vol. 30, Mar. 1, 1932, pages 106-108. Reports on tests carried out in the Cr baths of the Krämer & Kleinschroth Co. (abbreviated "Kr") the characteristic feature of which is that the H_2SO_4 content exceeds 1.2% referred to the CrO_3 concentration. For "Kr" electrolytes of various compositions the most favorable results were secured at 1.5, 1.7 and 2.5% H_2SO_4. The current efficiencies are 20-50% larger than in ordinary baths. The current densities are graphically presented for 5 and 10 amps. at 20° and 35° C. The "Kr" electrolyte is rather insensitive toward fluctuations in the H_2SO_4 content and works satisfactorily at 3.5% H_2SO_4. It is furthermore claimed that the H_2 absorption is less pronounced in the "Kr" baths than in the conventional Cr electrolytes. Measurement of gases liberated in vacuo at 300° C. yielded 80-100% H_2 more in case of standard Cr baths. This explains the flawlessness of the novel Cr-platings. Further advantages are claimed in regard to increased throwing power and insensitiveness towards Fe-contents. EF (7a)

The Adhesion of Electrodeposited Nickel to Brass. A. W. HOTHERSALL. *Engineering,* Vol. 134, July 8, 1932, pages 51-53. Condensed from paper read before the Electroplaters' and Depositors' Technical Society, London, May 18, 1932. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 347. LFM (7a)

METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Evaporation of Lead in Homogeneous Leading. (Bleiverdampfung beim homogenen Verbleien.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Oct. 16, 1932, page 544. Abstract of paper by Engels & Froboese in *Archiv für Hygiene*, Vol. 96, 1932, pages 69-101. Investigations of the authors show rate of Pb evaporation to be dependent on nature of flame of blowpipe. The H-O flame causes strongest evaporation of Pb. Flames containing hydrocarbons, as acetylene-O, illuminating gas-O, cause much less evaporation. In using such flames danger of poisoning in performing Pb coating work can be considerably decreased. It is shown that Pb enters air in form of highly dispersed PbO haze which stays in suspension for a long time. GN (8)

Surface Protection of Aluminum. (Oberflächenveredelung von Aluminium.) *Oberflächentechnik*, Vol. 9, Nov. 15, 1932, page 233. While oxide film forming on surface of Al is very favorable from standpoint of resistivity against chemical action it is a hindrance against refining surface by electroplating or coloring. Method is described by which at first an oxide film of a certain nature is produced by alternating current in a soda bath and then partly reduced in alkali bath; on Al thus prepared any metal may be deposited but Ni is preferred as it adheres best, and on this base other metals such as Cu, Cr, Ag, etc. are deposited. Another method of surface refining consists in producing an oxide film of different colors by electrolysis, especially suitable for signs, placards, etc. Ha (8)

Cadmium Coating vs Zinc Coating. (Verkadmierung an Stelle von Verzinkung.) *Apparatebau*, Vol. 44, Dec. 23, 1932, page 177. After discussing advantages of Cd coatings as compared with Zn coatings such as brighter color, small solubility in diluted H_2SO_4 and HCl, practically attack-proof in alkaline solutions, greater ductility, various methods of processing such coatings are discussed. GN (8)

The Electro-Metal Spraying Process. (Das Elektro-Metallspritz-Verfahren.) *Elektrotechnische Zeitschrift*, Vol. 53, Dec. 8, 1932, page 1178. Electric arc formed between 2 wires melts the metal which is removed by a jet of compressed air and sprayed onto the object to be metallized. An automatic arrangement moves the wires so that the arc is always maintained. A.c. as well as d.c. can be used for the arc. Compressed air sprays the molten metal with a velocity of about 300 m./sec. Ha (8)

How Can the Metal-Sprayed Surfaces of Boiling and Preparation Kettles be Improved? (Wie sind metallgespritzte Oberflächen von Koch- und Aufbereitungskesseln zu verbessern?) *Feuerungstechnik*, Vol. 20, July 15, 1932, page 109. The formation of a protective oxide film on sprayed Zn can be accelerated by treatment with NaCl. The inevitable pores in sprayed Zn-coatings are clogged by oxide and carbonate. This effect does not occur with Al, Sn, Cu and Pb. The resistance of Al-coatings on vessels for breweries, sugar refineries, laundries, etc., is improved by treatment with acids and carbonates. Spraying of Al onto grate bars is executed differently. A German company first heats the steel up to 650°-700° C. before spraying, while a French firm first sprays on Al and then treats it with borax + soda succeeded by an exposure to 500°-590° C. Sn spraying followed by a chemical treatment yields satisfactory results. Acids and silicates render those containers very suitable for food and oil industry and for margarine machines, baking ovens and cooking utensils. In Belgium railroad tank cars for crude oil and acids are sprayed with Pb on the inside and with Zn on the outside. EF (8)

Some Factors Affecting the Preece Test for Zinc Coatings. H. H. Walkup & E. C. Groesbeck. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 453-467; *Metal Industry*, London, Vol 41, Aug. 19, 1932, pages 177-178, pages 201-202. Cause of erratic results obtained in Preece test for testing Zn coatings was found to be formation of false end points, that is, appearance of adherent Cu on Zn coating before underlying base metal has been reached. Causes producing these false end points were found to be (1) variation in nature of Zn coating, (2) variation in Cu SO_4 solution employed, and (3) manipulation. These factors were investigated and it was recommended that procedure should be: clean specimen, if corrosion products are present, with fine sandpaper, immerse it in Cu SO_4 solution for 1 minute, remove and wash in running water, then wipe with a cotton swab and finally rub it with a soft pencil eraser until surface appears bright. Repeat this procedure until true end point is indicated by appearance of an adherent Cu deposit which has a characteristic bright color before and after rubbing. Ha + VVK (8)

X-Ray Investigations of Electrolytically Oxidized Aluminum. (Röntgenographische Untersuchungen an elektrolytisch-oxydiertem Aluminium.) E. Schmid & G. Wassermann. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft XXI, 1933, pages 83-87. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 113. (8)

Some Reactions Occurring in "Hot-Dipping" Processes. E. J. Daniels. *Metal Industry*, London, Vol. 41, Sept. 16, 1932, page 281; *Engineer*, Vol. 154, Sept. 23, 1932, page 310; *Engineering*, Vol. 134, Sept. 23, 1932, page 351. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 68. Ha + LFM (8)

Protection of Aluminum and Duralumin by Zinc and Cadmium Coatings. (Protezione dell'alluminio e duralumino con rivestimenti elettrolitici di zinco e di cadmio). Mario Gambioli. *L'Aerotecnica*, Vol. 12, Mar. 1932, pages 313-320. After a review of various methods usually employed for protection of Al and duralumin against corrosion, especially varnishes, anodic oxidation, parkerization, protalization, and a discussion of investigations of Cournot and Molnar, Grard and Cazaud, elements contributing to success of electrolytic coatings are set forth. Experiments carried out at Chemical Laboratory of "Direzione degli Studi ed Esperienze" of Italian Air Ministry are reported and results pointed out. Procedure employed for electrolytic coating of Al and duralumin with Cd and Zn is described in some detail. Corrosion tests proved high efficiency of these methods of protection. GG (8)

The Protection of Metals by Metallic Films. E. S. Hedges. *Commonwealth Engineer*, Vol. 19, Feb. 1, 1932, pages 251-256. The most successful method of preventing corrosion of metals has been found to be the coating of the base metal with a film of another metal. The writer describes the methods employed and the properties of the films produced and gives prominence to the protection of Fe on account of its wide use and ready corrodibility. Under hot dipping the author deals with Zn, Sn and Pb coatings. Then electroplating is discussed referring to Zn, Cu, Ni, Cr and other metallic deposits. The next chapter confines itself to metallic spraying and cementation including sherardising, chromising and calorising. See also *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 12. WH (8)

The Metal Spraying Process, Its Application in Electrical-Industry. (Das Metallspritzverfahren, seine Verwendung in der Elektroindustrie und im Installationsgewerbe.) Walter Hahn. *Oberflächentechnik*, Vol. 9, Oct. 4, 1932, pages 203-204. Process of metallizing objects of metal, glass, porcelain, gypsum, etc., is explained; almost any metal can be sprayed on as long as melting point is not too high. A wire of about 1.5 mm. is melted in a flame and atomized by a current of compressed air at about 2.5 atm. About ½ cc./min. is used. Advantages of method are particularly stressed for Zn spraying and Al spraying which gives a much better rust-protection than painting. Ha (8)

Zinc Coating of Iron and Steel. Report of Sectional Committee, J. A. Capp, Chairman. *Preprint* No. 29, June 1932, *American Society for Testing Materials*, 3 pages. Progress reports of the technical committees. VVK (8)

Galvanizing Ferrous Materials by Dipping and by Sherardizing. (Zincatura di materiali ferrosi per immersione e per sherardizzazione.) G. Calbiani. *La Metallurgia Italiana*, Vol. 24, Sept. 1932, pages 728-736. Discussion of processes of galvanizing by dipping and by sherardizing. Galvanizing gives better protection against corrosion. AWC (8)

Controls Galvanizing Bath Within 2-Degree Limit. W. M. Clark. *Steel*, Vol. 90, May 16, 1932, pages 30-31. Description of a new 80-ton galvanizing kettle recently installed in Bessemer, Ala., and equipped with a temperature control which maintains temperature of Zn to ± 2° F. JN (8)

The Protection of Iron and Steel from Corrosion. Ernest S. Hedges. *Metallurgia*, Vol. 7, Jan. 1933, pages 89-92. General discussion of metallic coatings. JLG (8)

Metal Spray Process. E. Benedict. *Industry & Welding*, Vol. 5, Jan. 1933, pages 18-22. Convenience in applying a sprayed coat on any metallic or nonmetallic material for protective or ornamental purposes is discussed and preparation of piece and manual and automatic spraying methods reviewed. Ha (8)

Sal-Ammoniac and Flux Conditioners in Metalware Galvanizing. Wallace G. Imhoff. *American Metal Market*, Vol. 39, June 16, 1932, pages 5, 8; June 17, 1932, page 8. Sal-ammoniac is still largely used in metalware hot galvanizing. Best qualities of a sal-ammoniac for flux are: (1) it should be clean, and not filled with dirt or dead material; (2) it should contain plenty of moisture, and not be dried out, hard, or in lumps; (3) it should be high in ammonia content, since ammonia is one of components that keeps flux in a proper state by setting up conditions for constantly supplying $ZnCl_2$ which is body of flux; (4) crystals should be of a medium size for ordinary work, not too large or too small. Corrosion after pickling and conditions of molten flux itself are taken up. DTR (8)

Detinning Tinplate. (Weissblechentzinnung.) Herbert Kurrein. *Chemiker Zeitung*, Vol. 56, Oct. 26, 1932, pages 849-851. In the electrolytic method a solution of 9-10% NaOH and Na_2SnO_3 with or without NaCl is used. The Fe tanks usually also act as cathodes. The Sn cans are placed in Fe baskets in the solution for 2 to 7 hours, using 2 v., 100 amps./m.^{2}, and 70° C. Most of the Sn deposits in the form of a sponge on the cathode while some dissolves as Na_2SnO_3. The NaOH must be replenished periodically. In the Cl method the cans are first cleaned with NaOH and steam and dried and are then compressed into briquettes. These are treated in large cylinders with Cl gas under ¾ to 2 atmospheres pressure forming $SnCl_4$. The end of the reaction is indicated by the pressure becoming constant. The cylinders must be cooled to prevent overheating. The Fe left from the cans can be remelted in open hearth furnaces. The $SnCl_4$ is used in the silk industry. This process is better than the electrolytic method. A third process in which the Sn is dissolved in a caustic solution is satisfactory for small installations. CEM (8)

Tarpon Metallizing and Hot Air Method. (Tarpon Metallisieren und Heissluftverfahren.) G. Kutscher. *Verkehrstechnik*, Vol. 48, Feb. 6, 1932, pages 82-83. Tarpon method involves following steps: sand-blasting of metallic carrier, spraying on of high temperature resistant lacquer mixed with metal powder (Al), treating of coating with a hot air blast to secure a dense coating and intimate contact with the metal underneath. The impermeability towards water, the mechanical resistance against surface injuries, the short time of producing the coating (10-12 m.^{2}/hr.), the thorough removal of water and the marked resistance towards corrosion are stressed. WH (8)

Effects of Carbon and Iron in Blue Powder on Sherardizing. Masao Kuroda. *Rikagaku Kenkyusho Iho*, Vol. 10, 1931, pages 698-702; *Scientific Papers Institute Physical & Chemical Research*, Vol. 61, 1931, pages 125-126 (In English). Effects of addition of C, Fe, Al or NH_4Cl to Zn powder used in sherardizing process were studied. Mild steel pieces were heated with respective powder, mixed above materials for several hours at 370°, 390° or 400° C. Effect of addition on velocity with which Zn layer is formed was determined by measuring thickness of Zn layer formed in photomicrograph taken. By adding C velocity of formation of Zn layer is increased by 50%, which is maximum on heating at 400° C., with addition of 2% C. Addition of Fe or other materials is harmful. TM (8)

Metallic Cementation of Ferrous Alloys (La cémentation métallique des alliages ferreux). Joseph Laissus. *Aciers Spéciaux, Métaux et Alliages*, Vol. 7, June 1932, pages 200-206. Discusses in detail theory of diffusion of some special elements in ferrous alloys. (a) Cementation by Cr. Microscopic examination reveals that Cr cementation produces 3 distinct kinds of constituents: solid solution, an eutectic zone, and an external bright and hard layer which appears if cementation temperature exceeds 1000° C. (b) In cementation by W, Mo and Ta there are formed 2 constituents: a solid solution and a compound. (c) Co and V form solid solutions. U forms an eutectic zone similar to that produced by C. (d) Boron forms a layer of solid solution, then one of eutectic, and finally the Fe-B compound which is brittle. (e) Ti and Zr behave alike forming solid solution and also an eutectic zone probably consisting of Fe-C-Ti, Fe-C-Zr when the cementation temperature is 1000° C. GTM (8)

Thin Gauge Copper Developed as Wrapper for Protecting Pipe Line Coating. A. L. O'Brien. *Oil & Gas Journal*, Vol. 31, Sept. 29, 1932, page 63. Cu foil (.0017" thick, 1 oz./ft.^{2}) can now be made in continuous lengths up to 48" wide. Necessity of providing against soil stress effect in pipe coatings by wrapping them and use of Cu foil for this purpose is advocated. VVK (8)

Centrifugal Galvanizing Process Is Adapted to Hollow Work. K. P. Rolston. *Steel*, Vol. 90, Apr. 18, 1932, pages 31-32. Centrifugal process of hot dip galvanizing has been successfully adapted to galvanizing of hollow-ware, such as pipe fittings, by a system which immerses empty centrifuge basket in spelter bath till it acquires same temperature and coating as dipper and its contents. JN (8)

Aluminizing of Metallic Surfaces in a Melt of $AlCl_3$-NaCl. (Das Aluminieren metallischer Oberflächen in einer $AlCl_3$-NaCl Schmelze). W. A. Plotnikow & N. N. Graziansky. *Zeitschrift für Elektrochemie*, Vol. 39, Feb. 1933, pages 62-67. A coating of Al by electrolysis was obtained in an electrolyte of 3 $AlCl_3$ – 2NaCl or 2$AlCl_3$ – NaCl. Vessel must be of Al which at the same time serves as anode. Other metals were quickly attacked by the hot electrolyte at about 200° to 300° C. Deposited Al fills all unevennesses of rough surfaces and gives a smooth bright surface when polished. No evaporation of the electrolyte occurs when the tank is closed. The greatest thickness of coating of 0.08 mm. is obtained at 200° C. and a cathodic current density of 1 amp./dm.^{2} Samples aluminized in this way had a greater corrosion resistance in H_2O vapors and saturated NaCl solution than pure rolled Al sheet. Metallographic examination revealed the formation between Al and Fe of an intermediary layer of Al, a solid solution of Al in the Fe. Al coating adheres very firmly and does not spall; it endures bending to 45°, when coating cracks. Aluminated samples had a longer life than those not aluminated. Ha (8)

Mist Plating Widens Scope of Deposition. John Strong. *Brass World*, Vol. 28, Oct. 1932, page 204. Practically any dry material can be metallized by vaporizing the plating agent in a high vacuum. Sliver of plating metal is placed inside a small W wire coil suspended between 2 metal posts or standards, current is passed through coil, and at high temperatures, a fine metallic mist begins to rise within chamber, covering uniformly everything inside jar. Mist plating has been done with Au, Ag, Sn, Al, Ir, and Cu. Au has been mist plated to a thickness of 1-50 μ. WHB (8)

New Metal Protection Methods. (Neue Metallschutzverfahren.) W. Widerholt. *Der Werksleiter*, Vol. 6, Dec. 1932, pages 288-291. Author first discusses recently developed methods of Al plating, as they have become known under the names of Alclad, Albondum, Allautal, Duralplat. To increase durability of such materials when corroded, Dürener Metallwerke first remove corroded layer by chemical attack and then put on a new sprayed layer of a duralumin special alloy. Methods of Cr plating are considered. Gives an extensive review of newer nonmetallic coatings of Al, as parkerizing, bonderizing, Jirotka method, Atrament method (see *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 319), B M V method and Eloxal method. Protection methods for Mg and Mg alloys are discussed. GN (8)

INDUSTRIAL USES & APPLICATIONS (9)

Aluminum in Architecture. Aluminum Company of America, Pittsburgh, 1932. Boards, 5½ x 8½ inches, 234 pages. Price $1.00. This is another of the authoritative handbooks of engineering data on the application of aluminum and its alloys to commercial uses prepared by the technical staff of the Aluminum Co. A previous one was on Aluminum in Aircraft. As in that handbook, this one does not gloss over whatever difficulties and drawbacks exist in the use of the materials, but presents engineering facts in engineering fashion. Aluminum is well known to have made a considerable place for itself in architecture, but most readers of the handbook will be surprised to find how many are its architectural uses. It will interest architects, engineers and metallurgists. H. W. Gillett (9)-**B-**

Metal Aircraft Construction. M. Langley. Gale & Polden, London, 1932. Cloth, 5½ x 8½ inches, 240 pages. Price 15 s. This book is essentially a review of modern international practice in metal construction of aircraft. Although it is intended for the use of those who are engaged in aeronautical engineering it will be most valuable both to the scientist and the mechanical engineer in other fields of metal construction. In aircraft construction they are meeting problems which must also be faced in other branches of metal working, metal joining, protection and heat-treatment of metals and alloys. Great progress has been made in this important industry towards solving many difficult questions. The book will help to realize how solutions might best be obtained and how the problems might best be attacked. Those who were working on the scientific side of these questions will also welcome the opportunity to become acquainted with problems in practice. In looking through the volume the discussions of the welding of the fuselage have appealed to the reviewer as being particularly valuable. For instance, there are examples of serviceable and bad joints. The examples of bad joints show rather instructive figures with too much oxygen used, with too much acetylene used, with too little welding wire used and welding done at too low a temperature or with unsuitable metal, containing too high a percentage of C. Another part of greatest interest is the construction of tanks for petrol, oil and water. The materials to be used are considered, the different methods for working and jointing briefly discussed. Among the means of making the joints gasoline-tight the "De Bergue" riveting method is worth mentioning. After an introductory chapter on the development of metal aircraft dealing with the reasons for the change from wood to metal and with the influence of metal on design, the next chapter gives a good discussion of the properties, manufacture, composition and classification of Fe, steel, alloy steel, Al and Mg including a section on proper choice of materials. The following 4 chapters cover the subjects of main plane structures, fuselages, flying boat hulls and seaplane floats and subsidiary structures containing, among others, detail design and methods of testing, braced structures, welded structures, Air Ministry regulations on welding, mechanical joints, workshop procedure and its influence on design and corrosion protection. A final chapter is devoted to workshop processes including stampings, pressings and the soft die process, heat-treatment of duralumin, anodic treatment of duralumin, Cd plating of mild steel, riveting, solid and tubular with design data. Tables of specifications and strength of materials are appended. In each of these chapters the author presents a well-digested critical outline of scientific fundamentals and their industrial application. Description of all important types of both American and European design are given in considerable detail with the help of more than 240 carefully selected diagrams and photographs.
Georg Goldbach (9)-**B-**

Friction of Some Babbitt Roller and Ball Bearings. Edw. R. Maurer. *University of Wisconsin Engineering Experiment Station Bulletin* No. 72, 1931, 48 pages. Babbitt, flexible roller and ball bearings were tested with regard to temperature rise and power consumed at different temperatures; the friction coefficients were determined. The results are given in numerous curves; details must be obtained from the paper. Test apparatus is described. Ha (9)

Manufacture of Bearing Bushings for Railway Coaches and Cars in a Railroad System. (Fabrication des Coussinets pour Voitures et Wagons dans un Reseau de Chemin de Fer.) L. Audo. *Revue de Fonderie Moderne*, Vol. 26, July 25, 1932, pages 233-239. Detailed description of the manufacture of bearings and bushings. The latter are made of 2 compositions: type B_1, Cu 90, Sn 8, Zn 2; type B7, Cu 77, Sn 6, Pb 17. Ha (9)

New Trends in Permanent Way Construction. (Neue Zielrichtungen im Oberbau.) Bäseler. *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 87, Jan. 1, 1932, pages 11-13. Covers the bedding of the permanent way up to the underside of the upper rail flange, the rusting of rails and rail fastening devices, the utilization of rust-proof wedges as fastening means and their further advantages. Author suggests clamping of rail foot by means of a simple spring. EF (9)

The Manufacture and Use of Steel Railway Sleepers. R. Carpmael. *Engineering*, Vol. 132, Dec. 18, 1932, pages 767-769, 775-778. Includes discussion. Condensed from paper read before the Institution of Mechanical Engineers, Dec. 11, 1931. LFM (9)

Aluminum or Copper? C. Featherstone Coles. *Electrical Review*, Vol. 110, April 15, 1932, pages 561-562. Abstract of a paper read before the London Branch of the Association of Mining Electrical Engineers. Al is rapidly taking place of Cu for conductors. Having only 30% the weight of Cu and 61% of the conductivity of annealed Cu, its weight for equal conductivity is about 48% that of Cu. Price of Al is controlled while that of Cu fluctuates over a wide range. Scrap values are affected by these prices. Steel wire is no longer commonly used because its deterioration places too much work on the maintenance department. In combination with Cu and Al, steel wire finds a very welcome place. Elongation test is not satisfactory unless made with a machine that will automatically record graphically. Torsion test is reliable for comparison with accepted standards. In the case of galvanized steel wire, the wrapping test gives misleading results, as a thin layer of Zn that will not crack may be less acceptable than a thick layer which may crack. The cone-type clamp is preferable to the bolted clamp because of the higher breaking loads which can be obtained. A 0.0175 in.^{2} steel-cored Al conductor used with a bolted clamp had a breaking load of 16,800 lb., whereas, used with a cone-type clamp, the breaking load was 18,500 lb. Main feature of cone-type clamp is that steel core is held separately from the Al or Cu strands. Includes discussion. MS (9)

Manufacture of Sheet Elbows. (Anfertigung von Blechrohrkrümmern.) Bothmer. *Die Schmelzschweissung*, Vol. 11, Aug. 1932, page 169. A diagram and table are given to determine the dimensions and shapes of sheets for forming 90° elbows without loss of material in cutting the pieces from a sheet. Ha (9)

New Metals and Speed for Cotton Ring Frame. E. E. Blake. *Textile World*, Vol. 81, Feb. 20, 1932, pages 26-27. The progress in textile operations due to improved materials and the replacement of cast Fe parts by ones of alloyed steel are reviewed. Ha (9)

The "Osram Cutting Metal" and Its Commercial Utilization. (Das Osram Hartmetall und seine Anwendung in der Technik.) A. Fehse & K. Schröter. *Technisch Wissenschaftliche Abhandlungen aus dem Osram Konzern*, Vol. 2, 1931, pages 207-217. Manufacture and properties of "Osram Hartmetall" (better known under the trade names "Widia" and "Carboloy") are reviewed. The utilization as a cutting means in metallurgical industries as well as the working and shaping of nonmetallic materials is considered. Instructions are furnished for the latter purpose, particularly for the working of hard rubber, marble, slate, etc. Attention is directed to the progress in boring of glass and porcelain due to Widia. In laboratories, Widia pestles for crushing of extremely hard materials in mortars are introduced. Numerous illustrations of tools involving Widia and further application possibilities are given. EF (9)

Chemical and Electrolytic Lesions of Mouth Caused By Artificial Dentures. E. S. Lain. *Dental Cosmos*, Vol. 74, Oct. 1932, pages 1030-1031. Metals of different potentials were found to register galvanic currents, which in some cases were considered dangerously high and Lain concluded that the etiologic factors were galvanic discharges. OEH (9)

Pistons Provided with Hard Piston Ring Carriers. (Kolben mit harten Kolbenringträgern.) E. Mahle. *Deutsche Motorzeitschrift*, Vol. 9, July 1932, pages 134-136. Short service periods of light metal pistons as compared with gray cast Fe ones in highly stressed motors are criticized. This deficiency is mainly due to rapid wear of foremost piston packing ring grooves of light metal alloy pistons which are relatively soft at elevated temperatures. A novel method is introduced which employs special piston ring carriers for first or first 2 or 3 piston rings. A special cast Fe, designated as "Ni-resist" and "Nimol," is used containing 15% Ni. Its thermal expansion coefficient is 18 x 10^{-6} which coincides with that of a Si-Al-alloy. The new piston ring carrier combines advantages of light metal and cast Fe pistons and also reinforces top of piston. EF (9)

Pipe Line Welding. W. H. Ludington. *Industry & Welding*, Vol. 5, Jan. 1933, pages 2-6. Entire procedure in laying a long pipe line welded by oxy-acetylene is described from the acquiring of the right-of-way to the finish. Ha (9)

The Benson Land and Marine Boiler—Construction and Results. F. Ohlmüller. *Steam Engineer*, Vol. 2, Nov. 1932, pages 64-71. C-Mn-Mo steel is used. AHE (9)

Steel Castings Lead In Exacting Service Requirements. Raymond L. Collier. *Foundry*, Vol. 60, Jan. 1, 1932, pages 41-43, 59. Gives data which will throw some light on subject, and aid engineers and designers in forming an opinion as to whether casting or welding is desirable form of fabrication and source of supply to employ for particular applications. In general, a properly designed casting will be found more rigid than a built-up part. When certain kinds of vibrational, bending and torsional stresses are present welded structures are not satisfactory and a steel casting is preferable. Welds properly made will stand up under moderate tensile and compression loads. Cast steel is an exceptionally good material for construction, while welding properly used is satisfactory and has a wide range of applications. VSP (9)

New Alloys. William J. Chapin. *Industrial Record*, Jan. 1933, pages 18-20. Uses and applications for stainless steels and alloys and heat resisting alloys are discussed. CBJ (9)

Aluminum in Textile Machine Construction. (Das Aluminium im Textilmaschinenbau.) C. J. Centmaier. *Kunstseide*, Vol. 14, Feb. 1932, pages 56-57. Discusses properties of Al alloys (Aeron, Duralumin and Scleron) which are of significance with reference to construction of textile machines. EF (9)

Searches for Self-Lubricating Bearings. Donald A. Clark. *Industrial Record*, Vol. 3, Oct. 1932, pages 21-23. New bearing metal has high oil content, averaging 35% by volume, which provides a hydraulic cushion that sustains severe pressures and shock loads; assembling is expedited; and wear and scoring of bearings and shafts is minimized. Powdered virgin Cu, Sn and graphite, majority passing 300-mesh screen, is mixed in definite proportions and fed into an automatic briquetting machine where, under high pressures, bearing is formed. Subsequent operations include heat treating, impregnating with oil and final sizing. CBJ (9)

The Importance of Design in the Production of Die Castings. Donald A. Clark. *Modern Machine Shop*, Vol. 5, Dec. 1932, pages 12-16. Methods employed in producing articles for utility as well as decorative purposes by die casting described and illustrated. Ha (9)

On Chemically Stable Special Materials. (Über chemisch beständige Sonderwerkstoffe.) W. Bautz. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 82-85. Summary of properties of materials used in chemical apparatus and machine construction. Austenitic Cr-Ni steels withstand attack of most of the cold acids and of all the alkalies. Among non-ferrous materials Cu-Ni alloys (Monel metal) Al, and Al alloys, alkali-proof electron metal and the highly resistant Pb are prominent. GN (9)

Steel Arches and Their Application to Mine Roadways. J. G. Belfitt. *Iron & Coal Trades Review*, Vol. 125, Dec. 30, 1932, pages 993-995; Vol. 126, Jan. 6, 1933, pages 14-15. Steel supports require smaller sections than timber; various shapes, their application and installation are described. Saving in a particular case was £438 in favor of steel supports. Ha (9)

Mn-Steel for Highly Stressed, Wear Resistant Parts in Cement Industry. (Manganstahl für hochbeanspruchte Verschleissteile in der Zementindustrie.) W. Borchers. *Zement*, Vol. 21, Mar. 24, 1932, pages 166-167. Demand for wear resistant material in cement manufacture is anticipated. Special cast steels must be employed. If wear and dynamic stresses prevail, Mn-steel with 12-14% Mn should be employed. Tensile strength is 90-120 kg./mm.^{2} and elongation amounts to 30-40%. Brinell hardness of 220-250 is lower than that of chill castings. Nevertheless hard Mn-steel is superior since it is fracture-proof and shows a homogeneous structure. Castings of more than 60 mm. diameter can be designed lighter thus eliminating higher initial costs. Mn steel is used in cast and wrought state. Recently sheets of 1-10 mm. with tensile strength of 90-120 kg./mm.^{2} and 30% elongation have been rolled and can be worked, riveted or welded. Use for various parts of cement industry machinery are given. EF (9)

Paris Aviation Show Reveals Developments in Reduction Gears and Superchargers. W. F. Bradley. *Automotive Industries*, Vol. 67, Dec. 10, 1932, pages 734-736. New developments in French airplane engine construction are described. Use of Al and steel alloys are mentioned. DTR (9)

A Special Method of Connecting Steel-Wires in Aircraft Constructions. (Un particolare modo di attaco per i cavetti d'acciaio nelle costruzioni aeronautiche). Silvio Bassi. *L'Aerotecnica*, Vol. 12, Mar. 1932, pages 351-353. Advantages of method consist in considerable saving in weight, compactness and cost, in comparison with conventional attachment. GG (9)

Austenitic Alloy Irons and Their Applications in the Glass Industry. G. S. Bell. *Glass*, London, Vol. 9, Nov. 1932, pages 474-477. Modern Ni and Ni-Cr cast irons find extensive use in glass molds due to their heat and corrosion resisting properties and absence of growing or scaling. Ha (9)

Modern Airplane of Materials Developed by Metallurgists. John Jackson. *American Metal Market*, Vol. 39, June 29, 1932, pages 3, 6. Commercial air transport plane of 1932, from one end to other, is of all-metal construction. This is exemplified in Boeing transport plane. Wing span 74 ft., length 51 ft., and overall height 16 ft. Fully loaded plane will weigh approximately 6 tons. DTR (9)

Light Alloys in Motor Vehicle Construction. Frank Jardine. *Metals & Alloys*, Vol. 3, Aug. 1932, pages 173-176. The author describes the application of Al castings, forgings and sheets in the chassis, body and motor construction in reducing the weight and thereby the operating costs of all kinds of motor vehicles. WLC (9)

Development of Specifications for the Strength of Airplanes from the Inception of the Flying Technique to the Present. (Die Entwicklung der Festigkeitsvorschriften von den Anfängen der Flugtechnik bis zur Gegenwart.) H. G. Kuessner & K. Thalau. *Luftfahrtforschung*, Vol. 10, June 21, 1932, pages 1-54. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 115. Ha (9)

Welded Constructions in Fine Mechanics. (Schweisskonstruktionen der Feinmechanik). G. Kodal. *Feinmechanik und Präzision*, Vol. 41, Jan. 1, 1933, pages 1-10. Great number of examples show application of butt and spot welding, seam welding, fusion and arc welding with and without protective gases in fabrication of small parts as they are used in manufacture of electric bulbs, radio tubes, telephones and other delicate apparatus. Spot welding replaces riveting. Almost all metals can be joined by these methods. Ha (9)

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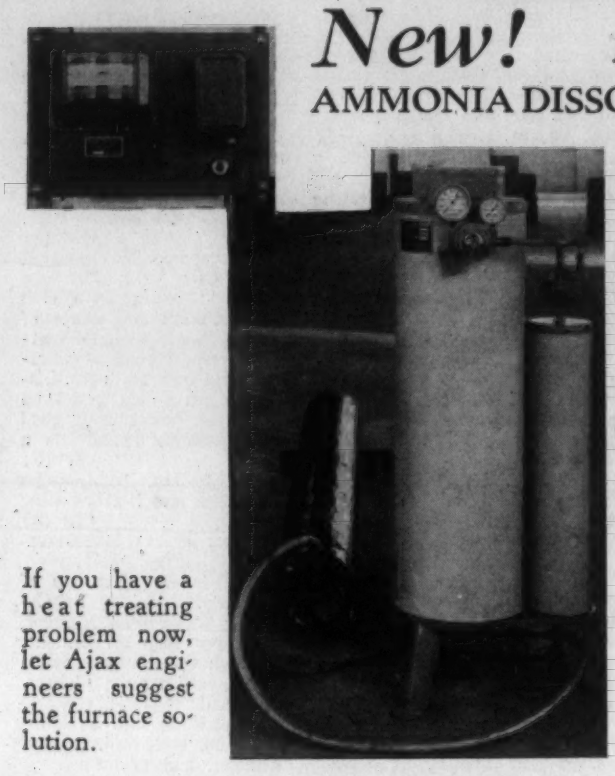

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White Bearing Metals and Their Testing. (Lagerweissmetalle und ihre Prüfung.) E. Fleischmann. *Forschungsarbeiten über Metallkunde und Röntgenmetallorgaphie,* No. 3, 1932, 89 pages. A series of 8 standard German bearing metals, of which only one is free from Pb: "Einheitsmetall" (75 Pb-15 Sb-10 Sn), "Thermit" (72 Pb, 20 Sb, 4 Sn. 1 Cu, 3 Ni), a graphited bearing metal (composition or proof that it contained graphite not given), a Cd-containing alloy (composition not stated other than that it was similar to one of the standard alloys), Bahn metal (0.75 Ca, 0.60 Na, 0.05 Li balance Pb), and an English alloy (undescribed save that it contained 93% Sn) were compared. Brinell hardness was determined at 20°-50°, 75° and 100° C. An unusual type of hardness test in which a Brinell ball was not forced in normally, but, instead, at an angle by a pivoted arm and definite weight so as to plow a furrow in alloy. was also employed at room temperature. This is claimed to give same information as a compression test, but to take less time. Bulk of report deals with friction tests in which a small specimen whose contour fits that of a rotating steel disk, the speed of which can be regulated is pressed against top of the disk under regulated pressure. Bottom of disk runs in oil. Disk is mounted on a pendulum so that friction can be measured. Specimen carries a socket in which a thermometer is placed. Friction and temperature curves are given for all alloys and for Pb and Sn, at following p/v values (p in kg./cm.^{2}, v in m./sec.), 80/12; 120/4; 80/4; 30/12; 30/4. After a running-in period (up to 5 hours), test is begun and carried on till an approximately steady temperature is reached, generally taking 60 to 80 minutes. Wear figures could of course be obtained in test, but are not reported, though comment is made that one of alloys lowest in Sn and highest in Pb wore badly at high pressure. Unalloyed Sn also wore badly. Bahn metal did not work well at high pressures. Nor did Einheitsmetall or alloys of about 42 Sn, 14 Sb, 3 Cu, 41 Pb. Thermit alloy gave very irregular curves and did not appear stable. There was not much difference in friction or temperature between alloys of 80 Sn, 10 Sb, 10 Cu and 10 Sn, 15 Sb, 1.5 Cu, 73.5 Pb. The best results at high pressures were obtained either with high Sn or high Pb compositions. At low pressures, most any of the alloys would serve. Battery Pb behaved better than some of the bearing alloys as far as temperature or friction go. This good behavior is characterized as "dumbfounding." Insufficient data are given to tell how consistent duplicate runs on the different alloys would be, duplicate data being shown for only one alloy. Nor is there any discussion of how closely the test results correspond with actual service. Brief comment on methods of chemical analysis is appended. HWG (9)

Inlay Castings. Herbert D. Coy. *Journal American Dental Association,* Vol. 19, Oct. 1932, pages 1760-1763. Praises the research done by the National Bureau of Standards in coöperation with the American Dental Association and outlines a procedure for making inlay casting, in which he compensates for shrinkage of the Au by expanding the wax model, using a warmed investment, and by casting into a mold heated to a red heat, at which temperature the mold has the maximum expansion. OEH (9)

A New Arc-Welded Continuous Rail Joint. W. D. Chapman. *Commonwealth Engineer,* Vol. 19, Mar. 1, 1932, pages 293-294. This article describes a new type of arc welded rail joint which has been designed by the technical staff of the E. M. Electric Co. Pty. Ltd., Melbourne, for the Victorian Railways. It is now under trial. The main characteristic of this joint is the insertion of a mild steel plate between the butt ends of the rail. Fillet welds are applied at the flanges and web and under the head of the rail, and a butt weld in the rail head where there must be no obstruction to the passage of wheel flanges. WH (9)

Alloy Steel Castings in the Quarry, Cement and Allied Industries. R. L. Collier. *Rock Products,* Jan. 9, 1932, pages 110-114. Reference to use of Ni-Cr-Mo, Ni-Cr, Ni-Mn steels and of heat-corrosion resistant alloys for equipment and apparatus. Ha (9)

Design and Construction of Propellers for Miss America X. E. R. Darby. *Metals & Alloys,* Vol. 3, Nov. 1932, pages 246-249. Describes principal features of this speed boat and requirements of various parts. Properties of 88-9-3 Al bronze used for propellers are given with data on production of castings. WLC (9)

Electron in Textile Machine Design. (Elektron im Textilmaschinenbau.) H. W. Ellinger. *Kunstseide,* Vol. 14, Feb. 1932, pages 57-61. Author shows which parts of textile machines should be advantageously made of electron. EF (9)

Steel Beams Modern Trend in Home Architecture. G. H. Danforth. *American Metal Market,* Vol. 39, May 26, 1932, pages 6, 8. Paper presented before "Small House Forum," under auspices of the American Institute of Steel Construction. Use of light weight structural steel shapes in home building is discussed. "J & L Junior Beam" is described. This beam is made in depths of from 6" to 12", each depth being rolled in one weight only. It is particularly adaptable for house construction. Writer cites existing trend toward use of steel beams in this class of work. DTR (9)

Neglected Safety Plugs. Alfred Dickson. *Steam Engineer,* Vol. 2, Nov. 1932, pages 57-58, 59. Pure Banca Sn melts at 450° F. When alloyed with small amounts of Pb and Zn melting point is raised. Pure Sn safety plugs are insulated and made ineffective by deposits from the H_2O. An example of the latter is given. AHE (9)

Slipping Road Fill Held up by Steel Suspenders. T. H. Cutler. *Engineering News-Record,* Vol. 109, Dec. 8, 1932, pages 684-685. System of steel plates suspended from top of fill holds slope of refilled slide of highway embankment. CBJ (9)

Pretreatment of Woven-Molded Brake Lining Controls Quality. Joseph Geschelin. *Automotive Industries,* Vol. 67, Dec. 10, 1932, pages 744-745. A flexible, combination woven-molded brake lining known as Grey-Rock Eagle has been produced. It is completely aged when it leaves the factory. Shipped in rolls and remains flexible on the shelf. This is all accomplished by a quality pretreatment process of the lining. In this process the 2 steps involve use of metallic wire in spinning the yarn and a powdered metal in plastic impregnating compound. Comparison made with a first quality asbestos lining indicates that structure of Grey-Rock brake lining is from 12 to 36% more dense depending upon the thickness. This lining is practically impervious to both water and oil, reduces drum scoring, and has a high degree of heat transference. DTR (9)

Applications of 18-8 Stainless Steel in Architecture and in the Industries. D. T. Haddock. *Journal American Welding Society,* Vol. 11, Nov. 1932, pages 37-39. Paper, May 24, 1932, New York Section Meeting, American Welding Society. Because of its permanent resistance to atmospheric corrosion, the application of 18-8 as a material of construction and ornamentation is now well established. Points out the economy of using this material in preference to nonferrous metals. Various applications in the architectural field, dairy industry, food handling, textile, paper, pulp and chemical industries are discussed. TEJ (9)

Pressure Vessels for Oil Cracking. Gustav Egloff, J. C. Morrell & E. C. Leonhardy. *Industrial & Engineering Chemistry,* Vol. 24, Nov. 1932, pages 1264-1275. Riveted, hammer-and electric-welded, and pierce-ingot type cracking vessels, with methods of fabrication, materials used, strength of vessels under various temperature-pressure conditions, wall thickness, life of the vessels, and X-ray method of testing welds are described. MEH (9)

Application of Principles of Low Weight Design to Vehicle Construction. (Die Anwendung der Grundsätze des Leichtbaues auf den Fahrzeugbau.) H. Groseck. *Verkehrstechnik,* Vol. 49, Sept. 24, 1932, pages 535-541. Abundantly illustrated, highly specialized paper gives a bird's eye view of low weight construction, i.e. utilization of thin metal sheets in special profiles and adoption of light metals, as applied to transportation problems. About 1/3 of paper presents suggestions of novel structural designs. WH (9)

Structural Steel in Buildings. O. Faber. *Structural Engineer,* Vol. 10, Jan. 1932, pages 2-3. Review of first report of Steel Structures Research Committee which aimed at a correction of British "statutory requirements governing the employment of structural steel in buildings. These specifications are quite unnecessarily onerous and tend to produce structures unnecessarily expensive, in which the economic benefit to be derived from the proper employment of structural steel is to a large extent lost." WH (9)

Aluminum Alloys in the U.S.S. Akron. G. O. Hoglund. *Metals & Alloys,* Vol. 3, Aug. 1932, pages 178-180. Describes construction of frame of Naval dirigible Akron. Applications of duralumin of yield point 42,000 lbs./in.^{2}, tensile strength 55,000 lbs./in.^{2} and a 4% Cu, 0.5% Mn, 0.5% Mg alloy of Al having 46,000 lbs./in.^{2} yield point, 61,000 lbs./in.^{2} with 10% to 15% elongation in 2", to this construction are described. WLC (9)

Application of Acetylene Welding in Mining, especially in Lignite Mining. (Anwendung der Azetylenschweissung im Bergbaubetriebe, insbesondere im Braunkohlenbetriebe.) W. Hoenisch. *Autogene Metallbearbeitung,* Vol. 25, Oct. 1, 1932, pages 296-298. Examples of use of acetylene welding for making and repairing dryers, pipe systems, etc., are shown. Ha (9)

Edges of Good and Bad Razors. Correspondence from J. J. Curran. *Metal Progress,* Vol. 22, July 1932, page 58. Presents photographs (100x) of edges of commercial safety razor blades. Discusses factors influencing life of blades. WLC (9)

Stainless Steel as a Substitute for Precious Metals in the Construction of Orthodontic Appliances. George M. Anderson. *Dental Cosmos,* Vol. 74, Oct. 1932, pages 1006-1007. The steel is used largely in the form of .036" diameter wire. Illustrations of its use are lingual and labial arches, frames, and clasps. Attachments are made by passing a precious metal tube over the wire and then soldering, using a Au solder. Recent work has shown that attachments can be soldered onto stainless wires by using a Au solder and a flux of equal parts of potassium fluoride and boracic acid with a few drops of HCl added to make a paste. OEH (9)

Manufacture and Use of Powdered Metals. Chas. Hardy. *Metal Industry,* London, Vol. 41, Oct. 1932, pages 345-347; *Metal Progress,* Vol. 22, July 1932, pages 32-37, 80. Powdered Cr, Fe, Ni, Cu, Ag, Sn, Zn, Mo and W are now being produced by pulverizing electrolytic sponge. Metallic articles of low specific gravity are fabricated from these elements by compressing in dies at pressures ranging from 5000 to 250,000 lbs./in.^{2} followed by heat treatment to weld metallic particles at points of contact. Important applications of this process are manufacture of "oiless" self lubricating bearings, and of tungsten carbide alloys for metal cutters. Ha + WLC (9)

Nickel and Nickel Alloys in Marine Engineering. J. McNeil. *Institute of Marine Engineers,* Vol. 18, Dec. 1931, pages 1-16. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 9. EF (9)

Reduction of Manual Processes in Manufacture of Milk Cans by Acetylene Welding. (Verminderung der Arbeitsgänge bei der Fabrikation von Milchtransportkannen durch Azetylenschweissung.) W. Greiner. *Azetylen in Wissenschaft und Industrie,* Vol. 35, Mar. 1932, pages 40-43. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 304. WH (9)

Copper Radiators for Central Heating Systems. (Les Radiateurs en Cuivre pour Chauffage Central.) *Cuivre et Laiton,* Vol. 5, Aug. 30, 1932, pages 367-375; Sept. 30, 1932, pages 415-423. While heat conductivity of radiator metal itself is of minor importance, convection factor (transmission of heat from the surface of radiator to the ambient) is of greatest import and depends to a great extent on difference between temperature of outer surface of radiator and surrounding air. Ha (9)

HEAT TREATMENT (10)

Case Hardening & Nitrogen Hardening (10c)

Continuous Gas Carburizing in Practice. E. A. Thomas. *Metals & Alloys,* Vol. 3, Apr. 1932, pages 84-88. The author describes a continuous carburizing furnace and methods of control of the carburizing gas composition. It is stated that the furnace is low in first cost and cost of operation, that proper manipulation of time, temperature and gas ratios produces uniform carburization and that the design of the equipment facilitates direct quenching. WLC (10c)

Nitralloying Practice and Processes. J. W. Urquhart. *Heat Treating & Forging,* Vol. 18, July 1932, pages 409-411, 419. Has special reference to British developments. Leading producer uses 4 steels varying only in C content. Percentages of C are (1) 0.20-0.26%; (2) 0.26-0.35%; (3) 0.35-0.45%; (4) 0.45-0.55%. Other elements are Si, 0.35%; Mn, 0.65%; S and P 0.02%; Ni, 0.25%; Cr, 1.4-1.8%; Al 0.9-1.3%; and Mo, 0.10-0.25%. Mechanical properties are controlled by varying C content. Tensile strength varies from 35 tons/in.^{2} for (1) to 90 tons/in.^{2} for (4). Machinability is influenced by Mo content. Contains information on European nitriding steels given by A. Fry in his paper before the Iron & Steel Institute, May 5, 1932. MS (10c)

Continuous Gas Carburizer used by Chrysler on Steering Worms. E. A. Thomas. *Automotive Industries,* Vol. 66, Apr. 1932, pages 652-654. Description of a new type of continuous gas carburizer installed at the New Castle plant of the Chrysler Corp. In the manufacture of its own steering gears it became necessary to provide for the installation for the heat treatment of the worms and worm wheels (sectors). The furnace is both over- and under-fired and has alloy muffle made of bolted and flanged sections. Furnace capacity is 120 worms and sectors/hr. The following conditions led to the development and operation of this furnace: (1) faulty packing of parts in carburizing box; (2) impossibility of uniform heating of parts in the carburizing box; (3) if at high heats, the weight of other parts and carburizing compound on pieces in the lower section of the box; (4) shifting of parts as the boxes are pushed through the furnace; (5) dumping boxes while parts are still too hot. DTR (10c)

Control of the Depth of Case by Means of the Grinding Process. (Controle de la profondeur de cémentation par le procédé de rectification.) R. Thebault. *Arts-et-Métiers,* Vol. 85, Jan. 1932, pages 33-34. When heavy pieces are case hardened, there is no danger in having a deep case but if light pieces are concerned it is necessary to control the depth of this layer in order to preserve a sufficient core having good mechanical properties. With a precise grinding machine, it is possible to know exactly the depth of case: When the grinding wheel bites in the carburized layer, sparks formed are of a yellow color and have a bunch shape. When the soft layer is reached sparks are in long white trails. The method is not rapid and is not intended for operation control but is useful for establishing curves. FR (10c)

Studies on Carbides by Means of the Synthesis Method of Methane. (Karbidstudien mit der Methanaufbaumethode.) R. Schenck, Fr. Kurzen & H. Wesselkock. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 203, Dec. 30, 1931, pages 159-187. The mechanism of the isothermic synthesis of carbides by gases liberating C, as for instance CH_4 or CO, is discussed and applied for several metals. At 760°-800° C. Fe_3C is formed, at 600°-800° C. Cr_5C_2, WC is formed at 800° C. while at 700° C. the unstable W_5C_2 is formed; Mo_2C at 700°-800° C. No positive results could be obtained with Re as the reaction is too inert. Ha (10c)

Superficial Hardening of Steels. Cyaniding. (Durcissement Superficiel des Aciers. Cyanuration.) R. Thebault. *Arts-et-Métiers,* Vol. 85, Apr. 1932, pages 133-137. Hardening of steel can be obtained by using products (1) solid case hardening; (2) liquid cyaniding; (3) gaseous nitriding or nitrogen hardening. Composition of cyaniding bath is as follows: NaCn = 76%, NaCl = 22%, Na_2CO_3 = 2%. Furnaces can be of any crucible type; fumes from crucible must escape through chimney-hood. Crucibles are generally made of Fe-Ni-Cr alloys which have good resistance to oxidation at high temperatures and retain their strength well. Cast Fe crucibles cannot be used. Temperature of treatment; good results are obtained at 850° C.; temperature is controlled by means of immersion pyrometer. Preparation of pieces; absolute necessity of treating pieces quite dry. Duration of treatment depends upon steel composition. Quenching is similar to quenching after case hardening. Surfaces not to be hardened are Cu plated. Cyaniding is suitable for very thin hardened layers. Advantages of process are as follows: (1) Simplicity of operation and cleanness of shop. (2) Cleanness of pieces. (3) Regularity of temperature and absence of warpage. (4) Rapidity of operation. (5) Possibility of obtaining gray silver or marbled effect on pieces. FR (10c)

Aging (10f)

Precipitation Hardening. [Zur Frage der Ausscheidungshärtung (Aushärtung).] Otto Feussner. *Metallwirtschaft,* Vol. 11, Aug. 12, 1932, pages 450-451. The absorption by Pd of large volumes of H_2 at room temperature through the action of an electric current and the increase in hardness of the Pd from 40 to 110 kg./mm.^{2} during this process is discussed as an illustration of precipitation hardening. The theory is advanced that precipitation hardening in general consists of the difference between 2 opposite processes. The diffusion through the lattice of the excess of the substance which has been absorbed produces strains in the lattice and an increase in hardness. On the other hand the recrystallization taking place on raising the temperature is opposed to any increase in hardness. CEM (10f)

The Age-hardening of Metals. Paul D. Merica. *Transactions American Institute Mining & Metallurgical Engineers, Institute of Metals Division,* Vol. 99, 1932, pages 13-54. The Eleventh Annual Institute of Metals Division Lecture, delivered Feb. 1932. The available data on the mechanism of age hardening are reviewed, and evidence for the precipitation theory is cited. The available data indicate that hardening results in some systems on aging before discrete particles have actually precipitated. Bibliography of 65 references, and 61 references to tables which show the systems in which age hardening has been observed. JLG (10f)

Iron-Boron Alloys and 18-8 Steels plus Boron, Their Hardening and Precipitation Hardening. R. Wasmuht. *Metals & Alloys,* Vol. 3, Apr. 1932, pages 105-110. See "Hardening Phenomena of the Iron-Boron-Alloys with Particular Reference to Precipitation Hardening," *Metals & Alloys,* Vol. 3, June 1932, page MA 174. WLC (10f)

Malleableizing (10g)

The Metallurgy of Malleabilization. A. E. White & R. Schneidewind. *Transactions American Foundrymen's Association,* Vol. 3, May-June 1932, pages 88-124; *American Gas Association Monthly,* Vol. 14, Oct. 1932, pages 415-422. Factors affecting rate of malleabilization are, the stability of the carbide, the ease of graphite nucleus formation and the mobility of the carbon atom. As the temperature of soaking increases, the time for first-stage graphitization decreases logarithmically. The second-stage graphitization is affected similarly. A high soaking temperature favors the formation of small, numerous, elongated carbon particles; a low temperature favors fewer, large rounded particles. Si permits higher temperatures for second-stage annealing. Other factors being equal, as Si increases the time for malleabilization decreases logarithmically. High Si favors formation of numerous small graphite particles; low Si, few and large graphite particles. Carbon does not greatly affect annealing time. The atmosphere has no direct effect on annealing time. RJC + CHL (10g)

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JOINING OF METALS & ALLOYS (11)

Welding & Cutting (11c)

Metallographical Aspects of Resistance Welding of Non-Ferrous Metals. (Die Widerstandsschweissung der Nichteisenmetalle in metallographischer Betrachtung.) FELIX GOLDMANN. *Elektroschweissung*, Vol. 2, Oct. 1931, pages 195-200; Nov. 1931, pages 217-221; Dec. 1931, pages 232-237. After briefly discussing the formation of weld seams upon welding non-ferrous metals and alloys with special reference to the effect of welding temperature and time, spot, butt and lap welding of the following metals and alloys is outlined: Cu, Ni, Zn, Al, Mo, Pb, brass, bronze, German silver, Al alloys, Fe to brass, Fe to German silver, Fe to Ni, Fe to W, Fe to Cu, Fe to Al, Ag to brass, Ag to bronze, Ag/Au to German silver, Mo to Ni, welding of 2 non-weldable materials by using an interposed third material, Cu to brass, Ni, Al, brass to bronze, brass to German silver. Examination proves the great value of metallography for welding work. Typical weld structures are shown in 45 photomicrographs. GN (11c)

Shot-Welding Opens New Uses for Stainless Steel. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 67, July 1932, pages 4-6. Shot-welding produces resistance-welds of uniform size and quality due to a patented, timed control of the welding current. Shot-welding enables stainless steel (18-8), to be placed at the disposal of the engineer with many more uses. When formed in slender balanced sections it makes an admirable structural material for aircraft, rail-car, and other automotive applications where light weight, higher tensile strength and great resistance to fatigue are requisite. In production, shot-welding is accomplished by means of the Budd shot-welding machine. Its outstanding features are absolute uniformity of current supply, use of high current in a very short, controllable time element, and an automatic "weld recorder" which produces both a visible and audible record. With this shot-welding machine, intergranular corrosion, rendering 18-8 steels difficult to control under heating processes, is eliminated by reducing to a minimum the time interval of the weld. DTR (11c)

Welding Technique in the Cement Industry. (Die Schweisstechnik in der Zementindustrie.) ERNST FALKE. *Tonindustriezeitung*, Vol. 56, Sept. 5, 1932, pages 901-902; Sept. 12, 1932, pages 924-925. The paper discusses at length the application of fusion and electric welding to dredges, tramway cars, paternosters, screw conveyors, bins, drying drums, tube furnaces, pipe lines, foundation plates, pulleys, gears, locomotive wheel rims, frogs and crossings of railroad tracks, hammer crushers, rock drills, etc. The advantages of welded constructions are enumerated in many instances. 7 references. GN (11c)

Welding Aluminum Electrically. A. J. T. EYLES. *Electrical Review*, Vol. 110, Apr. 15, 1932, page 564. For arc welding of Al, electrodes should have same composition as material welded and a heavy coating of flux to envelop the arc, which should be as short as possible. Reversed polarity and currents of 85-100 amp, for a ⅛" electrode are used. Welding should be done as quickly as possible. A good welding flux should be used also in atomic-H welding. After welding the complete weld joint and surrounding metal must be thoroughly cleaned by washing and brushing with hot H_2O to remove all traces of flux. Electric resistance butt welding of Al differs little from ordinary practice. To prevent alloying of Al with Cu in spot welding, best results are obtained by using special electrodes tipped with an alloy such as Cu-W. Another method consists in Cr plating the electrode tips or inserting a piece of Cr in the Cu tips. Electrodes and electrode holders must be H_2O cooled. Diameter of contact surface should be between ⅛" and ¼". Contact surface of electrodes should be slightly convex. Only about 1/3-½ the pressure on the electrodes is necessary as compared with spot welding Fe or steel. Automatic spot-welding machines are recommended. MS (11c)

The Influence of Small Additions to the Weld Rods on the Welding of Copper. (Ueber den Einfluss von geringen Zusatzmengen in den Schweissdrähten auf die Schweissung des Kupfers.) WILHELM GELDBACH. *Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens*, Vol. 7, 1932, pages 42-64. See *Metals & Alloys*, Vol. 3, Mar. 1932, page MA 70. (11c)

The Classification Societies and Electric Welding. STANLEY E. EVANS. *Welder*, Vol. 4, Sept. 1932, pages 21-24. A comparison and discussion of the regulations for the application of electric arc welding to ship construction by Lloyd's Register of Shipping and the provisional rules issued by the British Corporation Register of Shipping. TEJ (11c)

Has the Vibration of a Piece During Welding an Influence on the Weld Structure? (Hat das Erschüttern des Werkstückes während des Schweissens Einfluss auf das Schweissgefüge?) KARL ETTER. *Die Schmelzschweissung*, Vol. 11, Aug. 1932, page 175. The structure is most unfavorably affected if for instance riveting or hammer welding is carried out simultaneously with electric welding, particularly so for Cu. Ha (11c)

Future Possibilities of Welded Frames for Houses. ERIC H. EWERTZ. *Welding*, Vol. 3, Sept. 1932, pages 525-526. General adoption of welded steel frames for houses would require millions of tons of steel and billions of feet of welding and would result in a sanitary, fire proof and economical home. TEJ (11c)

Researches in Arc Welding. G. E. DOAN & J. L. MYER. *Electrical Engineering*, Vol. 51, Sept. 1932, pages 624-627. A progress report reviewing briefly research of extreme importance in the electric welding field. It is impossible to strike an arc with 120 volts, between pure iron electrodes, in an atmosphere of pure argon. The implications of this result are far-reaching and may even necessitate modification of the present conception of the nature of the arc discharge. The slightest lessening in the purity of the argon altered the results enormously. WHB (11c)

Design and Construction of an Arc Welded Naval Auxiliary Vessel. HOMER N. WALLIN & HENRY A. SHADE. *Welding Journal*, Vol. 29, Aug. 1932, pages 230-235. Abstract of a paper which was awarded first prize in the second Lincoln Arc Welding Prize Competition. Details of construction of an all welded vessel of 300 tons displacement. Saving in weight over riveted construction was 17%. Saving in cost was $14,846.40, or slightly over 10%. TEJ (11c)

Progress Made in Welded Pipe Lines. N. E. WAGNER. *Welding*, Vol. 3, Sept. 1932, pages 536-537, 543-544. A brief history of the progress made in welding overland pipe lines which shows why the welding of pipe lines has reached its established place in the industry. TEJ (11c)

Lead "Burning" or Welding. ROBERT L. ZIEGFELD. *Journal American Welding Society*, Vol. 11, Sept. 1932, pages 33-37. Paper presented at the Fall Meeting of the American Welding Society in Buffalo, Oct. 4, 1932. Where lead is used as a vessel lining or piping material, seams are usually joined by fusion welding. Author describes process and mentions many applications. TEJ (11c)

Electric Current Supply for Welding. II. D. A. TRICKETT. *Welder*, Vol. 3, July 1932, pages 25-26. This instalment brings a tabulation of costs, for English conditions, per 1,000 hrs. for a 100 amp. 20 volt arc, comparing transformer with choke coil, transformer with resistance, a.c. motor driving d.c. generator with drooping characteristic and a generator with multi-operation. The first kind is the cheapest, the last the most expensive. Ha (11c)

Electric Arc Welding Instead of Water Gas Welding. (Lichtbogenschweissung anstatt Wassergasschweissung.) W. SCHÜLLER & CARL MASSMANN. *Elektroschweissung*, Vol. 3, Sept. 1932, pages 173-175. Supplementary remarks on mechanical tests of welded joints as reported in the former paper by Massmann. See *Elektroschweissung*, Vol. 3, May 1932, pages 96-98. GN (11c)

Carbon Arc Welding. A. Y. STIRRAT. *Welding Journal*, Vol. 29, Apr. 1932, page 501. Discussion of paper abstracted in *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 303. TEJ (11c)

WORKING OF METALS & ALLOYS (12)

Melting & Refining (12a)

Cast Irons with low Carbon Content and Special Cast Irons. (Les Fontes à Basse Teneur en Carbone et les Fontes Spéciales.) M. GUEDRAS. *Revue de Fonderie Moderne*, Vol. 26, June 25, 1932, page 213. Cast Fe with a content of 2 to 2.4% C can be easily obtained in the cupola furnace, according to the author, from a charge of 50% pig Fe and 50% scrap (chips from turned material), melted with 15-16 kg. coke/100 kg. of charge and at a wind pressure of 45 cm. water. Maximum charge 200 kg., limestone flux is added; the melting process is very rapid. It is recommended to make pig Fe suitable for the cupola process in the electric furnace. Ha (12a)

On the Deoxidation Course During the Production of Silicon Bearing Transformer Steel. (Über den Desoxydationsverlauf bei der Herstellung von siliziertem Flusstahl.-Transformatorenstahl.) P. BARDENHEUER. *Die Naturwissenschaften*, Vol. 20, May 27, 1932, pages 405-407. Covers the deoxidation of the impurities in steel, the effect of FeO and MnO on the properties of the steel, the additions of Si + Al, the oxide determination in steel according to research work in the Kaiser Wilhelm Institut für Eisenforschung, determination of O_2 bound to Si, Al, Mn, Fe, microstructural determination of oxide. Reports on tests on 4% Si transformer steel, the quality of which exhibited inexplicable irregularities. Ferrosilicon was added after 35 min., 60 min. and the rest during pouring. 3 diagrams show the O_2 content in relation to the time during the deoxidation as determined by both the hot extraction and H_2 reduction method. The latter is not suited for the O_2 determination when Si + Al are present. The author concludes that the course of the Mg deoxidation process can be clearly traced and urges the study of the influence of time. Due to the improved effective deoxidation methods the watt loss in the transformer steel was reduced materially. EF (12a)

The Behavior of Gaseous Sulphur and the Sulphur Balance in the Basic Open Hearth Furnace. (Ueber das Verhalten des Gasschwefels und die Schwefelbilanz im basichen Siemens-Martin-Ofen.) FRANZ EISENSTECKEN & E. H. SCHULZ. *Stahl und Eisen*, Vol. 52, July 14, 1932, pages 677-686. Report 233 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. Literature on the subject is reviewed and the writer finds that there is not much reliable data. In the present investigation a series of 15 preliminary tests and 5 practical runs were made. Approximately 3000 sulphur-gas analyses were made altogether. For the heating of the furnace a mixture of coke-oven and blast-furnace gas was used. Almost 99% of the S present was in the form of H_2S. It was observed that the air checkers, on passage of air, gave up S in the form of SO_2 to the passing air. The S given up was taken from the waste heat gases. The sulphurization and desulphurization reactions are dependent chiefly on the temperature. The transfer of S in the air checkers amounts to about 10 to 15% of the sulphur gas in the complete charge. The gas chambers retain about 60% of the S introduced by the mixed gas fuel. The action taking place in the gas chambers is dependent on the temperature, and also on the amount of CaO and Fe_2O_3 or Fe deposited on the gas checker brick lining. Above 1150° C. the desulphurizing action drops in the gas chamber. The most favorable desulphurization in the gas chamber is reached between 1000° and 1100° C. In this chamber the S present is in the form of Ca sulphide and Fe sulphide. During the waste gas periods the combined sulphides are converted over into sulphates, which for the most part immediately decompose and the deposited S again passes out with the waste gases. However a gradual enrichment in S takes place in the gas chamber. Theoretical deductions and principles of the sulphurization reactions in the chambers are presented. The sulphur gas is able to react on the metal bath only during the charging and melting periods. A reducing atmosphere produces an absorption of S by the bath, while for an oxidizing atmosphere the bath is desulphurized. Desulphurization of the bath begins as soon as slag is formed in large quantities. The total S absorbed by the bath during the charging and melting periods is given off during the refining and finishing periods. Moreover, the waste gases are still further enriched in S, this extra amount of S representing the original S-content of the bath. DTR (12a)

On the High-Frequency Induction Furnace. VI. The Production of High Speed Steel in the Coreless Induction Furnace. (Zur Kenntnis des Hochfrequenz-Induktionsofens. VI. Die Erzeugung von Schnellrehstahl im Kernlosen Induktionsofen.) PETER BARDENHEUER & WERNER BOTTENBERG. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, Report 203, 1932, pages 91-104. This is the 6th of a series of studies on high frequency induction furnaces. The authors say that the application of this type of furnace for the manufacture of high speed steel has come to almost a standstill, after rather rapid progress in its early development at the beginning of this century. Crucible furnaces were originally used for making melts of this material but increased production has led to the use of the electric furnace. After reviewing the literature a series of 12 melts were made in a 300 kg. furnace, an acid-lining being used for 8 melts and a basic-lining for the other 4 melts. The composition and weight of charge for each melt, average melting and casting temperatures, melting and finishing periods, and power required are all tabulated, together with analyses of finished steels and slags. After examining the structure and testing mechanical and physical properties it was indicated that high speed steel of exceptionally high cutting performance could be produced in the coreless induction furnace, providing careful supervision obtained in making the melts. The following considerations are important in getting a high quality product: (1) avoidance of any unnecessary overheating of bath; (2) complete solution and distribution of alloying reagents, especially the carbides, promoted by electrodynamic motion of the bath; (3) extensive refining of the melt, particularly in the acid-lined furnace, by repeated slag tappings; (4) separation of all slag particles prior to casting; (5) avoidance of introduction of gaseous impurities in the alloying substances. The average % composition of the most suitable steels are as given below, the melts to be made in an acid-lined furnace: 0.79 C, 0.21 Si, 0.29 Mn, 0.006 P, 0.014 S, 4.69 Cr, 17.45 W, 1.46 V, trace Mo, 0.16 Ni. 13 references. DTR (12a)

The Equilibrium of Certain Non-metallic Systems. Part III.—The Equilibrium of the Systems $MnSiO_3$-Fe_2SiO_4 and FeS-Fe_2SiO_4. J. H. ANDREW & W. R. MADDOCKS. *Iron & Steel Institute, Advance Copy No.* 1, Sept. 1932, 10 pages. Heating and cooling curves obtained with various mixtures are shown. Equilibrium diagrams were constructed from the heating curves. The $MnSiO_3$-Fe_2SiO_4 system is eutectiferous with limited solid solubility at both ends. A compound is possibly formed at 10% $MnSiO_3$. The eutectic temperature is approximately 1160° C. The system FeS-Fe_2SiO_4 is eutectiferous. The solid solubility of the silicate in the sulphide is very low. About 12% FeS is soluble in the silicate at low temperatures. The eutectic temperature is about 1000° C. Densities for mixtures in the following systems are given: MnS-MnO, MnS-$MnSiO_3$, MnS-Fe_2SiO_4, $MnSiO_3$-Fe_2SiO_4, and FeS-$FeSiO_4$. JLG (12a)

The Production and Application of Manganese Steel in Australia. D. CLARK & J. COUTTS. *Transactions American Foundrymen's Association*, Vol. 3, May-June 1932, pages 29-46; *Foundry Trade Journal*, Vol. 46, May 19, 1932, pages 305-307. The various processes for making Mn steel are described. Attention to design factors and correct risering is stressed. CHL + OWE (12a)

Precious-metal Scrap. *Metallurgia*. Vol. 6, Aug. 1932, page 114. Gives directions for recovery of Au, Pt, Pd and Ir from miscellaneous scrap. JLG (12a)

Open-Hearth Steel Process as a Problem in Chemical Kinetics. ERIC R. JETTE. *Transactions of the American Institute of Mining & Metallurgical Engineers*, Vol. 95, 1931, pages 80-123. Includes discussion. See *Metals & Alloys*, Vol. 2, May 1931, page 105. (12a)

Effect of Calcined and Unburnt Lime on the Production of Steel in the Basic Electric Furnace. (Einfluss von gebranntem und ungebranntem Kalk auf die Stahlerzeugung im basichen Elektroofen.) OTHMAR V. KEIL & ERICH CZERMAK. *Stahl und Eisen*, Vol. 52, Aug. 4, 1932. pages 749-758. Report 234 of Steel Mill Committee of Verein deutscher Eisenhuttenleute. Includes discussion. Raw lime and calcined lime are the most important slagging fluxes in the basic open hearth refining processes. In 1930 approximately 1,174,000 tons of lime were consumed in German steel mills. After a short review of the literature, experiments are described on the action of lime and limestone on melts in both 500-kg. and 7.5-ton electric-arc furnaces. Summary of all results was as follows: (1) Limestone increased the Mn and C losses during melting down. (2) In the case of low amounts of Mn and C in the furnace charge, this increased loss practically eliminates these 2 elements, while a stronger oxidation of the bath takes place, the effect of which is indefinite on the consumption of deoxidizing agent. (3) The greater refining action of raw lime appears to be indicated through an increased uniformity of the equilibrium of MnO and FeO in the slag to Mn in the bath. (4) From the time of the melting down up to the deoxidation, the Mn loss is similar for both fluxes, while the C loss with raw lime melts is somewhat higher. (5) Oxygen investigations, carried out by an improved H-reduction method, show an increased O-content of samples, which were taken from limestone melts after the melting-down period. A harmful excessive oxidation of the bath could not be ascertained, since there was equally high consumption of deoxidation reagent for equal end-point amounts of Mn of the bath, in the case of either lime or limestone melts. (6) The use of limestone requires a longer melting period. A theoretical calculation of excess flux checks with the practical large scale tests. (7) 50-kg. sample ingots of the 500-kg. melts in the small furnace as well as 100-kg. ingots of the 7.5- ton melts show decidedly marked external blistered or porous crowns when calcined lime is used. This blistered surface is never present in ingots when raw lime is used in the melts. (8) On the basis of gas determinations made in the laboratory, an average amount of 50 cc. gas/100 g. is found in steel samples from limestone melts, as against 86 cc. gas/100 g. in samples from calcined lime melts. This further confirms results stated in (7). The use of unburnt lime as a slagging flux in the production of steel in the basic electric furnace, when compared with calcined lime does not entail any disadvantageous metallurgical effects. The effect on the ingot solidification with non-Si steel appears to be even so favorable that the use of unburnt lime will not tend to lower the quality of the steel. The melting time as well as power requirements both are higher for limestone. DTR (12a)

Defects in Brass Pieces. (Les Défauts dans les Pieces en Laiton.) LEBRULY. *Revue de Fonderie Moderne*, Vol. 26, Aug. 10, 1932, pages 252-253. In order to obtain sound cast brass pieces the raw material should be carefully inspected as to its fitness, too much scrap should not be used; slag should cover the surface completely; the temperature of the melt should never go to the boiling point, and the melt should not be left longer than absolutely necessary. Only Cu phosphide should be used for deoxidation. Before pouring the surface must be skimmed completely. Other practical hints for the operation are given. Ha (12a)

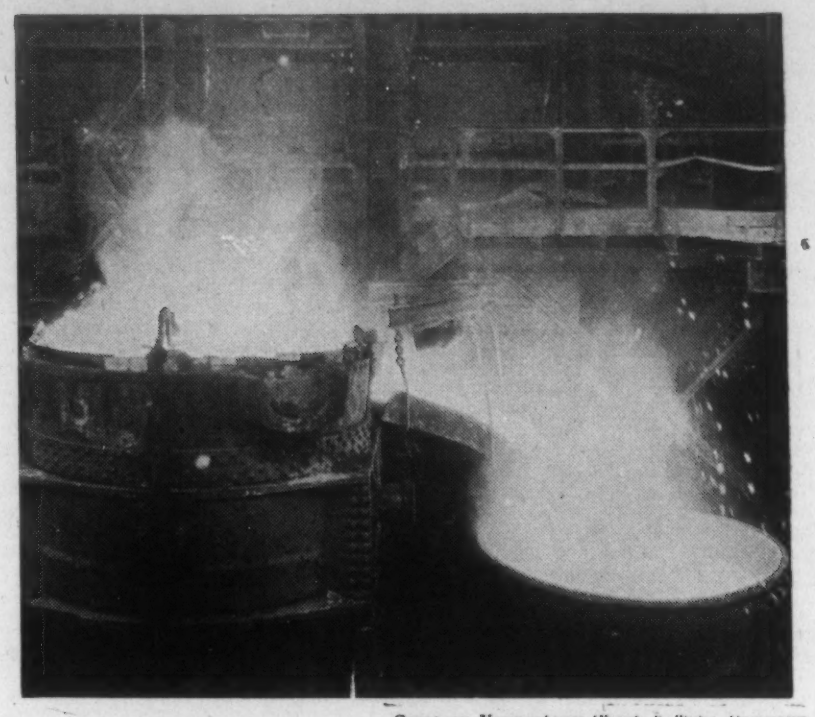
Measurements on the Velocity of Flow of Liquid Metal in the Electric Furnace. (Messungen der Strömungsgeschwindigkeit flüssigen Metalls im Elektroofen.) F. WALTER, M. RIEPE, H. IBERG & W. HARMSEN. *Forschung (Zeitschrift Technische Mechanik und Thermodynamik)*, Vol. 3, Sept./Oct. 1932, pages 252-258. Walter and Harmsen refute some of the results reported in the previous investigation by Riepe & Iberg. See *Forschung*, Vol. 2, 1931, page 413 GN (12a)

The Equilibria of the Reactions $Pb + SnCl_2 \rightleftarrows PbCl_2 + Sn$ and $Cd + PbCl_2 \rightleftarrows CdCl_2 + Pb$ in the Liquid Phase. An Application of the Ideal Law of Mass Action. (Die Gleichgewichte $Pb + SnCl_2 \rightleftarrows PbCl_2 + Sn$ und $Cd + PbCl_2 \rightleftarrows CdCl_2 + Pb$ im Schmelzfluss. Ein Beitrag zur Frage der Anwendbarkeit des idealen Massenwirkungsgesetzes.) FRIEDRICH KÖRBER & WILLY OELSEN. *Mitteilungen Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, Report 205, 1932, pages 119-136. The equilibria of these 2 reversible reactions are studied and compared with the ideal Guldberg and Waage Law of Mass Action, as well as with the modified and general Mass Action Law of Lorenz and Van Laar. In the beginning of the paper an exhaustive summary is made of the literature pertinent to metal-slag equilibria. For the reaction $Pb + SnCl_2 \rightleftarrows PbCl_2 + Sn$, a series of 57 melts are carried out with pure Pb, Sn, and their dehydrated chlorides. For final analyses of 1.84 to 98.5 mol % $PbCl_2$, and 0.45 to 96.5 atom % Pb, at 600° C., with melting time varying from 10 to 87 min., the values of K

$$K = \frac{(PbCl_2)\ [Sn]}{[Pb]\ (SnCl_2)}$$

are fairly constant, limiting values being 2.32 and 4.61. For 43 melts at 500° C. with melting times varying from 10 to 200 min. the limiting K-values are 3.50 and 8.90, under altered cooling conditions. The effect of temperature was separately observed in a 3rd series, in which for temperatures from 290° to 810° C, the K-values ran from 76.2 to 0.66. Values of K increased with lower rates of cooling. Appreciable deviations from the values corresponding to the ideal law did not occur on the side of the more noble metal, Sn. On the Pb side of the reaction the determined values did not check with those corresponding to the ideal and general laws. In order to hold these values near the curve of ideal values, higher rates of control had to be used. For the reaction $Cd + PbCl_2 \rightleftarrows CdCl_2 + Pb$, K-values were determined in 3 similar series of melts at 600°, 500° C. and a variable range of 387° to 800° C. At 600° C. in the amounts of 0.06 to 50 atom % Cd in the metallic layer, and 2 to 95 mol % $CdCl_2$ in the chloride or slag mixture, the K-values checked well with the ideal case. The average K-values 37.5 ± 5.5 also agreed well with other calculated figures. Again, deviations from the ideal curve were not observed for this reaction on the side of the noble metal. With high proportions of the less noble metal, considerable differences were noted. The effect of temperature for both reactions is essentially determined by the heats of formation of the solid slags, the metallic chlorides. It is easily possible to predict from the solidification diagrams, representing either of the reversible reactions, the direction of any deviations from the ideal case. Throughout the entire paper, values as determined or calculated by other investigators are constantly given, usually in the form of curves in order to furnish complete comparisons of all results. As a supplementary step the reaction $Cd + SnCl_2 \rightleftarrows CdCl_2 + Sn$ was examined with respect to effect of temperature. 44 references. DTR (12a)

Charging Devices for Electric Steel Furnaces. (Beschickungsvorrichtungen an Elektrostahlöfen.) H. REDENZ. *Stahl und Eisen*, Vol. 52, Aug. 18, 1932, pages 806-808. Includes discussion. Report 235 of the Steel Mill Committee of Verein deutscher Eisenhüttenleute. This paper represents a brief survey of recent innovations in the methods of charging electric steel furnaces in Germany. The old method of hand charging is discussed with total charging time for furnaces up to 14 tons capacity. Then the mechanical charging methods are taken up and illustrated. In this category come (1) chute charging through a working door on the side directly opposite the tap-hole; (2) basket charging, in which the crown and electrodes are taken out, a wire basket containing the charge laid in from the top and then the crown and electrodes replaced; (3) the "gun" charging crane, similar to the type used for loading open-hearth furnaces, except that with the electric furnace the electrodes must be elevated to give sufficient working space. Attention is called to the fact that in the case of a certain 10-ton electric furnace, that although the total charging time was reduced from 58 min. by hand charging to 14 min. with the "gun" charging crane, yet the total power consumed for either straight or low-alloy steel produced was 692 kw.-hr./ton with the hand method and 694 kw.-hr./ton for the mechanical method. DTR (12a)



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From Bessemer to the New Converter of Toussaint Levoz. (Du Bessemer au Nouveau Convertisseur Toussaint Levoz.) T. Levoz. *Revue de Fonderie Moderne*, Vol. 26, June 25, 1932, pages 203-206. The new type of converter differs from the Bessemer converter in that the air for combustion of the oxides and the refining is supplied laterally instead of from the bottom. It is claimed that the combustion, particularly that of SiO_2 takes place more rapidly and thoroughly. The heat balance of the old type converter is made up and compared with actual experiments made with the new type converter; it is claimed the latter reduces the oxidation zone and permits fewer tubes of smaller diameters and easier arrangement, and the air pressure can be reduced. Further it is said that smaller units can be operated economically. Ha (12a)

The Equilibria between Metals and Slags in the Melt. II. The Temperature Dependence of the Equilibrium $FeO + Mn \rightleftarrows MnO + Fe$ and its Influencing by Additions. (Ueber Gleichgewichte zwischen Metallen und Schlacken im Schmelzflusse. II. Die Temperatureabhängigkeit des Gleichgewichts $FeO + Mn \rightleftarrows MnO + Fe$ und seine Beeinflussung durch Zusätze.) W. Krings & H. Schackmann. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 206, July 1932, pages 337-355.

It had formerly been proved that the equilibrium constant $K_{Mn} = (FeO):[Mn]/(MnO)\cdot[Fe]$ is fairly constant at about 1550°-1560° C. over a great range of concentration and amounts to 0.0032 ± 0.0005. It was now investigated how this constant is influenced by temperature increase and additions as they occur in practical steel making; SiO_2, lime, calcium ortho-silicate and calcium meta-silicate were added to the melt. SiO_2 reduces the constant noticeably; the curve showing the dependence was drawn. Lime and calcium ortho-silicate increase the constant while calcium meta-silicate has no influence. A temperature increase increases the constant considerably. The dependence can be expressed by $\log K = -7280/T + 1.503$. The individual results are reproduced in tables and curves. Ha (12a)

Melting and Refining of Secondary Copper for Blooms, Billets and Plates. (Das Umschmelzen und Raffinieren von Altkupfer zwecks Herstellung von Walzbarren, Knüppeln und Platten.) R. Thews. *Die Metallbörse*, Vol. 22, Feb. 6, 1932, pages 161-162; Feb. 13, 1932, pages 193-194. The writer specifies the scrap material which should be used exclusively for the purpose discussed. Thews prefers small refining furnaces of 5-15 tons capacity to those of 50 tons. The addition of the scrap, and the melting and refining practice are given in full details. The next chapter is devoted to the casting procedure and stress is laid on the observation of the following points: insurance of a proper oxygen content, absence of gas inclusions, selection of proper mold material, and coating of the latter. EF (12a)

The Manufacture of Phosphor Bronze Strips. (Die Herstellung von Phosphorbronzebändern.) *Die Metallbörse*, Vol. 20, Jan. 9, 1932, page 35. The melting of the phosphor bronze (3-5% Sn, 0.05-0.1% P, balance Cu) is carried out in 75 kg. crucibles placed in gas, coke, oil fired or electric furnaces. 300 × 37 mm. split molds are used. The mold is coated with a mixture of tallow, powdered charcoal and pure clay. The surface of the ingots must be absolutely smooth. The reductions during rolling should be only ½ those generally applied to brass. The annealing times must be longer than is the case with brass. EF (12a)

Melting down of Finely Divided Tin Powder. (Zusammenschmelzen feinverteilten Zinnpulvers.) *Die Metallbörse*, Vol. 22, May 14, 1932, page 611. Note from *Zvetnye Metally* 1931, Vol. 2, pages 204-221, referring to experiments of Vaninkov, Muratch & Genvarsy to cut down the oxidation losses on melting down Sn dust obtained during the Sn chloride distillation. Inorganic salt mixtures, as KCl, $CaOCl_2$, Na_2SO_4, NaCl did not yield favorable results. The oxidation losses amounted to 40-50%. Organic protective layers of petroleum pitch yielded an output of 90% of the Sn content present. The same or still better results were secured in a reducing atmosphere of CO. 2 products are obtained: Silver white Sn globules of 99.55% purity and a dark powder with 89.5% Sn. The former are melted down under $CaOCl_2$ and the latter under an acid slag of borate. EF (12a)

The Manufacture of Sound Steel. *Iron & Steel Industry & British Foundryman*, Vol. 5, Sept. 1932, pages 421-427. A very good discussion is given of the reactions underlying the elimination of P and S in the open hearth furnace. Production of high-class steel depends on careful selection of materials and balancing of charge, the early formation of slag, careful control of FeO in slag, a judicious use of deoxidizers, and careful control of casting conditions such as temperature, teeming speed, mold design and general attention in pitwork. CHL (12a)

Iron. (Eisen). Part A, Section 4, Gmelin's Handbook of Inorganic Chemistry. R. Durrer. 8th Edition. Verlag Chemie, Berlin, 1932. Paper, 7 x 10 inches, pages 587-846. Price 41 RM, on subscription for the whole handbook, 35.50 RM. This section of the volume on Fe deals with Fe-and-steel-making methods. The first 586 pages of the present volume, which is appearing in parts, dealt with history, the occurrence of Fe ores, with pure Fe and its properties, and made a start on technical Fe, carrying it through the blast furnace, and dealing also with direct reduction methods. This section starts with indirect methods for making Fe and steel, i.e., those starting with pig Fe. The puddling processes, both hand and mechanical, the crucible steel melting, Bessemer, open-hearth and electric processes for making steel are dealt with in the same comprehensive way that earlier sections have dealt with their subjects. Although this is a section in a sort of chemical encyclopedia, and while the chemistry of steel making is fully dealt with, it is very decidedly a book for the metallurgist as it discusses furnace design and operation as well as the refining processes. There are some 500 references to articles on the Bessemer process, from 1856 to 1931 and the other subjects are equally thoroughly documented. There are 137 illustrations in this section among which are many charts showing the change in bath and slag composition during refining by the various processes. While the bibliographic material is very complete, the volume is by no means merely a bibliography, for the text clearly brings out the salient facts. It is a monumental reference volume. H. W. Gillett (12a)-B-

Casting & Solidification (12b)

Blowhole Formation in Basic Open Hearth 12″ Castings with about 0.05% Carbon. (Blasbildningen i 12″ Göt av Basisk Martin Med Kolhalt Ca 0.05%). Stig. Casperson & K. E. Johansson. *Jernkontorets Annaler*, Vol. 116, Aug. 1932, pages 375-386. Ingots of 650 kg. weight (1425 x 300 mm.) were cast at temperatures varying from 1665° to 1625° C. at an average tapping time of 30 sec. The depth at which blowholes appeared was 6 mm. for the higher temperature and 13 mm. for the lower. For tapping times of 24 and 54 sec. the respective depths were 6 and 11.5 mm. Addition of Fe scrap and powdered ore was found beneficial. Metallographic investigation of the ingot showed an outer crystal zone, an intermediate crystal zone, and the inner blowhole zone in which most of the bubbles appeared to have been formed under pressure though a few were formed under vacuum. 5 references. HCD (12b)

Horizontal Casting of Pipe by the Green Sand Multiple Gate Method. Porter W. Allen. *Water Works & Sewerage*, Vol. 79, Apr. 1932, pages 127-128. Equipment and casting methods of McWane Cast Iron Pipe Co. described. Ha (12b)

Volume Changes of Cast Irons during Casting. C. M. Saeger, Jr. & E. J. Ash. *Transactions American Foundrymen's Association*, Vol. 3, July-Aug. 1932, pages 172-187. The volume changes occurring in 8 types of cast irons during cooling from the liquid state to room temperature are given. They vary in composition from gray Fe to white Fe. The coefficient of liquid shrinkage over temperature range studied was 0.011% per °C. During solidification the volume change varied from an expansion of 1.65% in gray Fe to a contraction of 5.85% in low C, low Si iron. Linear contraction of sand-cast bars varied inversely with Si and C contents and with cross-sectional area. All gray and white cast irons undergo an expansion during or immediately after solidification which begins at 1130° and reaches a maximum at 1070° C. CHL (12b)

Influence of Casting Practice on Physical Properties of Die Castings. Charles Pack. *Transactions of the American Institute of Mining & Metallurgical Engineers*, Vol. 93, 1931, pages 230-245. Includes discussion. See *Metals & Alloys*, Vol. 1, Nov. 1930, page 852. (12b)

Rolling (12c)

Most Efficient Roll Diameter. Pt. 1. Albert B. De Salardi. *Rolling Mill Journal*, Vol. 7, No. 1, 1932, pages 43-46. Based on A. Rejto's theory of plastic flow. According to this theory, when material is subjected to compression exceeding its elastic limit, the molecules will glide in a certain angle to the line of force. In a bar, some molecules glide in one direction, increasing the width. Molecules subjected directly to compressive forces glide in 2 directions, so that the resultant gliding will be in the direction of the compressive force. Molecules subjected to compressive forces from top and bottom are partly or totally handicapped in gliding while those in the center, compressed from all sides, are totally prevented from gliding. To deform this blocked center area, takes more compressive force. The gliding angle for hot mild steel is 41°. For a given height and reduction of bar, the most efficient roll diameter will be such, that the rolling operation requires the least energy due to absence of blocked area, rolled bar will be free from cracks caused by unequal sliding of the molecules, and wear of equipment will be a minimum. MS (12c)

Forging (12d)

A Very Large Hollow Forging. *Engineering*, Vol. 154, Oct. 21, 1932, page 414. Illustrates and describes a forging made by Thos. Firth and John Brown, Ltd. of Sheffield. It is said to be the world's largest hollow forging. It weighs 66 tons and is 48′ long, with an outside diameter of 78¾″ and an inside diameter of 71¼″. LFM (12d)

Heating for Forging. Robert M. Keeney. *Metals & Alloys*, Vol. 2, Jan. 1931, pages 3-7. The author defines heat treatment and forging and points out that forging involves a heat treatment as well as a forming operation. Production of quality forgings involves the use of suitable steel, application of heat uniformly, at the proper rate and in a suitable atmosphere to prevent excessive scaling, thorough heating of the entire piece to the desired temperature and working at the proper rate and finishing as near the critical range as possible. The same principles applying to the application of heat for heat treatment apply to heating for forging. Effects of overheating, heating too rapidly and ununiformly are discussed. Lengthy heating periods result in excessive loss of metal by scaling. The effect of amount of reduction on the grain size is discussed. Furnaces for heating for forging are discussed as to source of heat, temperature control, and atmosphere in light of the principles mentioned. 10 references. WLC (12d)

Time Study in Drop Forging. (Bestimmung der Arbeitszeiten beim Gesenkschmieden.) M. Zscheile. *Maschinenbau*, Vol. 11, June 2, 1932, pages 228-229. Studies have been made as to the time required for the manipulation from the raw material to the finished part, the energy necessary for the deformation, and the efficiency of the hammer. A large increase in efficiency resulted. A large number of charts and data are given. RFV (12d)

Machining (12g)

Some Thoughts on Tungsten Carbide. F. L. Pyle. *American Machinist*, Vol. 76, May 26, 1932, page 674. The principal points of getting ideal conditions for the use of tungsten carbide tools are having a machine of proper weight, rigidity and power. The practical rules to be observed in approaching such conditions are summarized. Ha (12g)

Investigations on the Occurrences of Chip Formation and Wear on ½″ Screw Taps for Nuts. (Untersuchungen über Zerspanungs- und Abnutzungsvorgänge an Muttergewindebohrern von ½″ Durchmesser.) Albert Pampel. Doctor's thesis, Technische Hochschule Dresden, 1931, 96 pages. 3 and 4 slotted screw taps were used in the experiments; the cutting forces and the changes on taps and nuts made were measured. The principal results are: The chips should flow off easily, i.e. the grooves should have the largest possible cross-section. For this reason 3-slotted taps are better fit than 4-slotted. Large negative chip angles and large core hole diameters are preferable. An affect of the cutting speed was observed only on the 4-slot taps. Grinding the flanks conically towards the shaft is superfluous, back grinding of the flanks is detrimental. The C content of the nuts made is not the only factor determining chip formation. The cutting forces do not permit conclusions on workability. Condition of the coolant is of no importance, however, dry cutting must be avoided. The wear of the screw taps first increased rapidly, then slower till growing blunt. GN (12g)

Machine Tools and Tungsten Carbide Steel. H. W. Rogers. *Western Machinery World*, Vol. 22, Apr. 1931, pages 156-157. A general discussion of the principal points which have to be considered in the use of tool steels and tungsten-carbide tools. Ha + WHB (12g)

The Chipping Methods of Sinker and Reamer. (Die Zerspannungsverfahren des Senken und Reibens.) A. Wallichs & H. Schallbroch. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Feb. 13, 1932, pages 161-162. The difference between sinking and reaming is defined as follows: sinking is a preparatory method while reaming is a finishing process. The energy consumption, forces and stresses occurring in the 2 methods have been investigated on various metals with and without cooling agents. A table gives the average enlargements in thousandths of a mm. obtainable for different metals dry and with cooling agents. Ha (12g)

Fine Drilling. (Feinbohren.) K. Oehler. *Deutsche Motorzeitschrift*, Vol. 9, May 1932, pages 102-104. Additional information on the new method of cylinder drilling previously discussed by Iby (*Deutsche Motorzeitschrift*, Vol. 9, Jan. 1932, page 16) and Fritsche (*Deutsche Motorzeitschrift*, Vol. 9, Mar. 1932, page 56). Reports on various tests which were demonstrated at the Leipzig Spring Fair. In contrast to general drilling practice, the new method avoids finishing treatments on cylinders, which are now drilled by one operation at extremely high revolution speeds but small feeds. EF (12g)

Cutting Diamonds. (Schneiddiamanten.) E. Winter. *Die Werkzeugmaschine*, Vol. 36, Aug. 31, 1932, pages 306. The author discusses some points of the former paper by Fetzer, *Die Werkzeugmaschine*, Vol. 36, May 15, 1932, pages 159-161. It is stated that much higher cutting speeds are possible than those given by Fetzer, for instance, commutator brushes have successfully been machined with a speed of 5000 m./min. Recent types of diamond tool holders, developed since 1930, are described. Remarks made on grinding diamonds. GN (12g)

Diamond Tools for Machining of Metals. (Diamantwerkzeuge für Metallbearbeitung.) A. Meyer. *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Sept. 10, 1932, pages 101-103. The paper deals in particular with new methods of mounting diamonds for machining tools. Mounting diamonds in a ball-like seat is best, for in this case no stresses are set up in the holder; depths of cut of up to 1 mm. can then be used. The cutting angles of diamond tools are fundamentally different from metallic cutting tools. Depth of cut generally varies between .02-.6 mm., feed between .02-.1 mm. The cutting speed should be as high as possible and not slower than 60 m./min. Diamond tools average 1000 service hours before regrinding. The excellent machining properties of diamond tools are not surpassed by any other tools. GN (12g)

Drawing & Stamping (12h)

Plastic Working of Metals and Power-Press Operations. E. V. Crane. John Wiley & Sons, New York, 1932. Cloth, 6 x 9¼ inches, 326 pages. Price $4.00. It is obviously cheaper, in quantity production, to force a metal part into the desired form than it is to machine it into that form. What can be done by "chipless forming" depends on the plastic properties of the metal being worked, the die and press equipment that the job can afford, and the ingenuity of the engineer in devising methods to fit the particular case in hand. Most forming operations involve so complex a flow of metal that the exact contour and clearance of the dies cannot yet be exactly calculated by engineering formulae, but require some cut and try corrections. However, the fundamentals can be expressed in at least semi-quantitative fashion. This book so expresses those fundamentals, and gives a clearly-reasoned discussion of the why and wherefore of many of the factors involved in engineering judgment. The author has reasoned out the behavior of metals, dies and presses in the course of many years connection with the E. W. Bliss Company, and sets down the facts and beliefs collected through his wide experience. Copious illustrations help to clarify the points discussed. There is much metallurgy involved, since the engineer is strictly limited by the plastic properties of the metal and its rate of strain-hardening. The metallurgy is brought in all along through the book, as needed, and as a result, the metallurgist will find every page of as much interest as will the engineer. The treatment is primarily from the point of view of selection of a press of the proper capacity and type, and of the design of dies of proper form for the particular material and product. Questions of choice of metal for severe forming, of testing incoming stock for uniformity and suitability, as well as those of lubrication, are, of course, brought up in casual fashion, but are not directly tackled. The author's attitude is to see what can be done with the material the metallurgists supply him. The subject of die steels and their heat-treatment is not touched upon, nor is that of the age-hardening of deep-drawing steels. There is room for another volume dealing still more specifically with the metallurgical problems involved. The book deals with shearing and allied operations; bending; bulging, etc.; cold working and hot working, deep-drawing; cold forging, coining, etc.; and with hot working. Charts for graphical computation of working pressures, speeds, etc., are appended, and a few problems are given for solution. The book should appeal to a wide circle of production engineers and metallurgists. The book-making is good and the price is low for an engineering reference book of its type. It is clearly written and bears evidence that the author is not only writing with a wealth of experience, but is also intensely interested in his subject. It is not a professorial type of text book written from the outside looking in, but gives an engineer's inside view. H. W. Gillett (12h)-B-

Production of Brass Cylinders of Intricate Shape. (Herstellung komplizierter Zylinder aus Messing.) A. Wiederhoff. *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Sept. 10, 1932, pages 107-108. Drawing of complicated brass cylinders, generally made by machining, is described. The product attains highest accuracy when the devices for drawing and pressing are properly constructed and the manufacture is carefully supervised. GN (12h)

Rational Production of Stator and Rotor Sheets. (Rationelle Herstellung von Stator- und Rotorblechen.) Josef Kreuzer. *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Sept. 10, 1932, pages 105-107. Discusses the production of these sheets with the aid of modern high speed stamping machines. GN (12h)

Cleaning (12k)

The Removal of Sand from Castings. (Le Dessablage des Pieces de Fonderie.) E. Tourneur. *Revue de Fonderie Moderne*, Vol. 26, May 25, 1932, pages 173-181. The points of view entering into the installation of equipment for cleaning the castings are discussed. Sandblasting methods, cleaning by acids, by water pressure and the apparatus for these methods are described and a few installations illustrated. Ha (12k)

Surface Treatment before Machining. (Oberflächenbehandlung vor der Bearbeitung.) G. Prachtl. *Die Werkzeugmaschine*, Vol. 36, July 31, 1932, pages 266-267. The paper discusses the various methods of cleaning castings, pressure water cleaning and sand-blasting. The use of steel granules, a hardened alloy with 2.64% C and 1.30% Si is pointed out. Pickling, painting and coating are dealt with. GN (12k)

Polishing & Grinding (12l)

Grinding and Polishing with Felt Disks. (Einiges über das Schleifen und Polieren mit Filzscheiben.) W. Mueller. *Oberflächentechnik*, Vol. 9, Apr. 5, 1932, page 71. The method and different polishing agents to be used with felt disks are briefly discussed and described. Ha (12l)

Grinding Machines for Welded Rail Joints. (Schienenstoss-Schleif- und Feil maschinen.) Przygode. *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 87, Sept. 1, 1932, pages 334-335. Automatic electric grinding machines of the Schiess-Defriess Co. are briefly described for removing the burr occurring during welding of rail joints. EF (12l)

An Experimental Study of Metal Polishing by Flexible Polishing Wheels. Edwin M. Baker & George E. Holbrook. *Transactions Electrochemical Society*, Vol. 50, 1931, pages 483-498. Includes discussion. See *Metals & Alloys*, Vol. 2, Sept. 1931, page 184. (12l)

A Highly Smooth Finish and the Material. (Feinstbearbeitung und Werkstück.) O. Nieberding. *Maschinenbau*, Vol. 11, June 16, 1932, pages 261-264. Method of producing highly smoothed surface on any machine part, the improvement of the service of any piece of material by a smoother finish is discussed with particular attention to the fitting of two machine parts, the abrasion resistance and the properties of the material in general. RFV (12l)

Coloring (12m)

Industrial Methods for Old Silver Coloring. (Industrielle Methoden zur Altsilberfärbung. K. Altmannsberger. *Metallwaren Industrie und Galvano-Technik*, Vol. 29, Aug. 15, 1931, pages 360-361. The 3 main methods used for inducing an antique appearance to solid Ag and silver plated objects are dealt with: (1) coloring in a bath which contains 3 g. Pb $(C_2H_3O_2)$ + 140 g. $Na_2S_2O_4$/l. H_2O. The coloring, which is due to the change of PbS_4O_6 to PbS, successively passes the following colors: yellow, golden, blue, violet, steel-gray. The working temperature is 60° C. and the Ag surface is roughened before coloring. (2) Arsenic coloring is carried out in a bath of 50 g. H_3AsO_4 + 20 g. Na_2CO_3 + 25 g. KCN/1000 cc. H_2O. (3) Colors produced by K_2S last longer but are more expensive than according to method (2). The Ag ware is first dipped into a solution containing 15 g. K_2S/l. and then submerged in a bath consisting of 9 g. $CuSO_4$ + 3 g. H_2SO_4/1000 cc. H_2O. Next the objects are polished with fine pumice and then shortly dipped into a weak KCN-NaOH solution. Cd plated Fe can also be colored like antique Ag by treating it with a solution containing 60 g. $KClO_3$ + 40 g. $Cu(NO_3)_2$. The precipitated Cu is immediately oxidized. EF (12m)

Chemical Coloring of Cadmium Deposits. (Chemische Färbungen von Kadmiumniederschlägen.) H. Krause. *Chemiker-Zeitung*, Vol. 55, Nov. 4, 1931, pages 845-846; Nov. 11, 1931, pages 862-864. See "Coloring of Cadmium Coatings," *Metals & Alloys*, Vol. 3, May 1932, page MA 139. CEM (12m)

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DEFECTS (13)

A Proposed Systematic Classification of Defects in the Foundry. C. Gierdziejewsky. *Foundry Trade Journal*, Vol. 47, Sept. 1, 1932, pages 127-128. See *Metals & Alloys*, Vol. 3, July 1932, page MA 221. OWE (13)

Boiler Defect due to Crack of Riveted Lap of a Tube. (Kesselschaden durch Nietnahtriss eines Flammrohres.) A. Sulfrian. *Archiv für Wärmewirtschaft und Dampfkesselwesen*, Vol. 14, Jan. 1933, pages 13-15. Chemical composition, mechanical properties and microstructure of tube destroyed were examined. Deposits between sheets and under rivets were also investigated. Though caustic brittleness was first suspected, causes of defect were found to be as follows: (1) Too high a content of S, P and N of cracked tube plate, (2) low notch toughness, also in normalized state, (3) careless heat treatment in as delivered state, (4) stresses set up were not equalized by subsequent heat treatment, (5) too high riveting pressure causing cold deformation. GN (13)

Welding the Defects of Castings. (Das Ausschweissen von Gussfehlern.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 2, 1932, page 393. Reuss welding flux, marketed by K. A. Bock, Brandis near Leipzig, Germany, is a liquid in which part to be welded and welding rod are dipped before welding. By using this liquid the material welded is covered with a fine film, thus eliminating detrimental effects of air and simultaneously chemically combining oxides present or formed during welding. Mechanical properties of welds made on cast Fe with this liquid do not differ from those of base metal as data show:

	Cast Fe as delivered	Welded
Tensile Strength kg./mm.^{2}	20.71	20.78
Transverse Strength kg./mm.^{2}	38.3	38.1
Deflection in mm. (Distance of supports 600 mm.)	9.5	9.1

GN (13)

Causes and Elimination of Hardening Defects. (Härtefehler, ihre Ursache und Abstellung.) *Die Werkzeugmaschine*, Vol. 36, Oct. 15, 1932, pages 358-359. Causes of defects in hardening drills, milling cutters, forging dies and various size forgings are discussed with special reference to importance of uniform heating and quenching and maintenance of proper quench water temperatures. GN (13)

Iron Castings Excessively Hard and Brittle. (Pièces excessivement dures et fragiles.) *La Fonte*, Apr. 1932, pages 136-137. Fracture of castings exhibit the "inverted chill" structure i.e. white Fe inside and gray Fe outside. Composition of cast Fe employed is: Total C 3.03%, Si 2.55%, Mn 0.27%, S 0.145%, P 1.35%, Mn content is too low and S content too high. Defect can be suppressed by introducing manganese pig Fe (containing about 3% Mn) and lowering the foundry returns (heads and sprues) in the cupola charges. FR (13)

Inclusions—Their Effect, Solubility and Control in Cast Steel. C. E. Sims & G. A. Lillieqvist. *Foundry Trade Journal*, Vol. 47, Aug. 11, 1932, pages 77-82. Reprint of technical publication No. 453, of the American Institute of Mining & Metallurgical Engineers. See *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 253. OWE (13)

Occurrence and Causes of Porosity in Non-ferrous Metal Castings. (Ueber Porositäts- Erscheinungen und- Ursachen in Nichteisenmetallguss.) Günther Schwietzke. *Doctor thesis, Technische Hochschule Aachen*, 1932, 43 pages. After a comprehensive review of literature on subject and his investigations, author distinguishes between porosity due to shrinkage and porosity due to gases. Both types of porosity may appear together. Defects due to pipes are frequently underestimated, since pressure may be set up, thus causing occurrences of unknown nature. Typical cases of pipes and micro-pipes, their causes and methods of avoidance are discussed and shown. Behavior of SO_2 and H_2 to melts of Cu, Ni, Cu-Ni, Sn bronze, Al bronze, brass and a Cu-Ni-Sn alloy was studied. As to behavior of SO_2 to Cu and bronze former results are substantiated. (P. Röntgen & G. Schwietzke. *Zeitschrift für Metallkunde*, Vol. 21, 1929, page 117). SO_2 caused porosity in Cu, Ni and pure Cu-Ni alloys but not in Sn and Al bronze, brass and Cu-Ni-Zn alloy. These results are theoretically discussed at length. Results of tests on behavior of H_2 to those melts indicate that detrimental effect of this gas, as contrasted with SO_2 has been underestimated. All melts treated with H were more or less porous. In rapidly cooled Cu and Al bronze melts appearance of coarse blowholes besides finer pores was most significant. Whether or not presence of O is essential for solution of H in metals is not yet known, but may be possible. Possibilities of lessening detrimental effect of gases, methods of avoiding absorption and removing occluded gases or rendering them harmless by binding are discussed. 47 references. GN (13)

Defects in Manufacture of Silver Sheets. (Mängel bei der Silberblechherstellung.) E. Raub. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle*, Vol. 6, July 1932, pages 29-32. Cu-Ag alloys are very sensitive to temperature; if they are overheated during annealing (for forging, rolling, etc.) structural and changes of outer form take place, material cracks and tears in working processes. Inclusions of foreign matter, mostly steel particles or CuO_2, are very harmful, and give rise to defects on surface when rolled out. Examples of defects are reproduced. Ha (13)

Progress of the Knowledge regarding Slag Inclusions in Iron and Steel. C. Benedicks & H. Löfquist. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 445-456. Revised equilibrium diagrams for the systems Fe-Mn-O, Fe-Si-O, $FeO-Fe_2O_3-SiO_2$, and a quadratic diagram for FeO-MnO-FeS-MnS, are shown and brief reference made to recent literature, especially the work of Herty and associates. 107 references. HWG (13)

Defects in Water Pipe Lines. (Die Zerstörung in den Wasserleitungsröhren.) A. Lütje. *Der Mineralwasser-Fabrikant*, Vol. 35, July 25, 1931, pages 778-780. Author discusses the defects encountered in Pb water pipe lines due to selection of improper material, to mechanical influences from the outside and to corrosion attack of water. EF (13)

Experiences in Operating Airplane Engines. (Erfahrungen beim Betrieb von Luftfahrzeugmotoren.) Bruno Bruckmann. *Zeitschrift für Flugwesen und Motorluftschiffahrt*, Vol. 23, July 28, 1932, pages 423-433. Report 302 of Deutsche Versuchsanstalt für Luftfahrt. Part III of the paper is of special interests to the metallurgist. It reports and deals with the causes of failures of a great number of airplane parts such as crank cases, cylinders and accessories, valves and valve springs, pistons, crankshafts, bearings, etc. The remedies are discussed. 5 references. GN (13)

Notes on Plant Breakdowns and Failure. G. Ness. *Journal West of Scotland Iron & Steel Institute*, Vol. 39, Part III, Dec. Session 1931-32, pages 31-48. Some outstanding instances of plant failures are submitted and discussed. In first case there was a boiler 30 ft. long by 8 ft. 6 in. in diam. This boiler exploded due to a bad welding and the rapid erosion of plates caused by steam. The analysis of the black incrustration removed from underside of scale was:

Insoluble residue	0.46%
Iron oxide as Fe_2O_3	74.13%
Chlorine	0.17%

The second failure was of somewhat similar nature. In order to determine the speed of erosion and oxidation a test was carried out on a steel of the following composition: 0.15% C, 0.53% Mn, 0.055% S, 0.059% P, 0.028% Si. The history of the plate during the test is shown in a series of photomicrographs. 2 more cases of boiler failures are given. Next was taken up the engine breakdown. The failure which occurs in electrical plant is common and is generally most of it due to dirt, oil. GTM (13)

CHEMICAL ANALYSIS (14)

On the Determination of Sulphur in Steel and Pig Iron. Hiroshi Sogo. *Tetsu to Hagane*, Vol. 18, Sept. 1932, pages 981-1003. Several experiments on subject were carried out with ease and accuracy, and reliable results were obtained. In cases of plain C and special steels, oxidation method by HNO_3 and HCl is most reliable process to get accurate results while evolution method shows very low results due to incomplete solubility. In case of pig Fe, evolution method is only useful to estimate small part of S; most of S remains in evolution flask. Application of oxidation method by HNO_3 and HCl nearly always gives low results, as a considerable amount of S remains in residue with SiO_2 and graphite. In this method residue must be analyzed for S. Therefore in present investigation, determination of total S in pig iron was made by fusion method with a mixture of Na_2O_2 and Na_2CO_3 (1 : 1). Author found this method a most reliable and universally applicable one for determination of S in pig Fe. TS (14)

Table of Arc Spectrum Lines Arranged in Order of Wave Length. Welton J. Crook. Stanford University Press, Stanford University, California, 1933. Paper, 8½ x 11 inches, 32 pages. Price $2.00. A list of all the lines of the metallic elements between 2800 and 3400 A.U. Wavelengths are given to 0.1 A.U. A table of persistent lines is appended. F. M. Walters, Jr. (14)-B-

Methods of Chemical Analysis for Ferrous Alloys. (Untersuchungsmethoden für Roheisen, Stahl und Ferrolegierungen, unter besonderer Berücksichtigung der legierten Stähle.) (Vol. 31 in Böttiger's series on Chemical Analysis.) J. Kassler. Ferdinand Enke Verlag, Stuttgart, 1932. Cloth, 6½ x 9¾ inches, 158 pages. Price 19.60 RM. This is the fruit of 30 years' experience in analysis of alloy steel raw materials and finished products. Perhaps the most valuable part of the book is the expressed and implied information as to Kassler's own preference for the one method over another. For example, in the determination of S in alloy steels and ferro-alloys, combustion in O_2 and titration of SO_2 appears to be the preferred method. The book is not intended for the beginner, since the methods, especially in the case of the less common elements, are not always given in great detail, but the experienced analyst will find helpful hints as to choice of methods and avoidance of interferences. The treatment would have been still more helpful if the different methods were more clearly characterized as to whether they are chosen primarily for precision or for speed. There are occasional side comments as to the accuracy of a method, but no systematic comparison of it for all methods given for a given element. Brief comment is given on micro-analysis for some of the more common elements when a sufficient sample is lacking for ordinary methods. Methods for Zr, Ta, U, B, Ce, and Be are indicated, rather sketchily. The determination of nitrogen is adequately discussed, but that of oxygen, either direct or by residue methods, was considered too extended a matter for detailed consideration in this volume. Many footnote references are given to the literature, but only rather standard and well-accepted methods are discussed, so that the reader is not too much confused by a bewildering array of alternatives. A book of this sort cannot be very original and its value depends on the author's experience and ability to select the most useful methods. This one contains but 158 pages, i.e., there has been careful selection and elimination of unnecessary material. H. W. Gillett (14)-B-

Studies of Various Methods for the Separation of the Common Elements into Groups. III. A New Method for the Separation of Zinc, Cobalt, Nickel and Iron from Aluminum, Chromium and Manganese. Ernest H. Swift, R. C. Barton & H. S. Backus. *Journal American Chemical Society*, Vol. 54, Nov. 1932, pages 4161-4172. It has been found that Zn, Ni, Co and Fe can be separated from Al, Cr and Mn by precipitation with H_2S having a controlled excess of sodium hydrogen carbonate and sufficient oxalate to prevent the precipitation of Al or Cr. By this method 1 mg. of any element of one group can be separated from as much as 500 mg. of any element of the other group. As a quantitative method it has been shown that 250 mg. of any element of the Zn group can be precipitated quantitatively from a solution containing 250 mg. of any element of the Al group and that less than 1 mg. of any element of the Al group will be carried down in the precipitate. MEH (14)

Studies of Various Methods for the Separation of the Common Elements into Groups. II. The Separation by Means of Sodium Hydroxide and Sodium Peroxide. Ernest H. Swift & R. C. Barton. *Journal American Chemical Society*, Vol. 54, Nov. 1932, pages 4155-4161. An experimental study of the separation of Mn, Fe, Co, and Ni from Al, Cr and Zn by means of sodium hydroxide and sodium peroxide has been made. With 250 mg. of each element present, from 1-3 mg. of Al remains with the Mn or the Fe, from 12-15 mg. with the Co, and 30-40 mg. with the Ni. The separation of trivalent Cr from these elements is unsatisfactory due to incomplete oxidation of the Cr. When the Cr is present as chromate, not over 1 mg. is carried down by any of the precipitates except Mn, where 7 mg. was co-precipitated. The separation of Zn is unsatisfactory, from 10-40% of it being carried down with the precipitates. MEH (14)

Experiments on the Spectrographic Determination of Traces of Substances. (Versuche über den spektrographischen Nachweis kleinster Substanzmengen.) Walter Späth. *Monatshefte für Chemie*, Vol. 61, Oct. 1932, pages 107-115. The spectrograph used was a Zeiss model with a 6 cm. dia. collimator lens and a 6 cm. dia. objective. The distance from the slit to the collimator was 30 cm. The electrode on which the samples were placed consisted of Ag which had been purified chemically and was finally obtained entirely free from Cd. The smallest amounts of metals which could be definitely determined by the spark method were 10^{-10} g. Cd, 10^{-10} g. Mn, 10^{-8} g. Tl, 10^{-7} g. Te, 10^{-7} g. As, 10^{-9} g. Li and 10^{-11} g. Sr and by the arc method 10^{-10} g. Cd, 10^{-8} g. Mn, 10^{-9} g. Te and 10^{-9} g. Tl. 6 references. CEM (14)

A Study of the Potassium Dithio-Oxalate Colorimetric Method for the Determination of Nickel. John H. Yoe & Floyd H. Wirsing. *Journal American Chemical Society*, Vol. 54, May 1932, pages 1866-1876. A study of the reaction between K-dithio-oxalate and Ni has been made with reference to its use in colorimetry. The reaction obeys Beer's law over a range in concentration suitable for colorimetric analysis. The reagent will detect one part of Ni in 125 million parts of solution when the observation is made with a 50 ml. Nessler tube. Many metallic ions interfere and must be removed. Fe and Co ions are likely to interfere most. MEH (14)

Identification of Molybdenum in Steels. (La ricerca del molibdeno negli accial.) C. Montelucci & M. Gambioli. *La Metallurgia Italiana*, Vol. 25, Jan. 1933, pages 12-16. A number of tests used in identifying Mo in steels, such as: with tannic acid, gallic acid, KSCN, diphenylcarbazide, potassium xanthogenate, $Na_2S_2O_3$, Mo blue, phenylhydrazine, are given in detail. Phenylhydrazine test, first proposed by Spiegel and Maas. (*Berichte*, Vol. 36, 1903, page 512) is preferred, as it permits identification of Mo in presence of Cr, these 2 occurring together in many modern steels. AWC (14)

Determination of Alumina and Silica in Steel by the Hydrochloric Acid Residue Method. J. G. Thompson & J. S. Acken. *Bureau of Standards Journal of Research*, Vol. 9, Nov. 1932, pages 615-623. The HCl residue method, as used by Bureau of Standards for determination of alumina and silica in steels, is described. Analyses of 6 steels indicate that this method yields results for both alumina and silica which compare favorably with those obtained by Br and HNO_3 residue methods. Of 3 methods, HCl method is preferred on grounds of speed and simplicity of operation. Data are presented to show that presence of aluminum nitride in a steel does not cause appreciable errors in determination of alumina by HCl residue method. Recovery of Mn oxide and silica from Mn silicates, by means of HCl method, is described. Data are presented to show that satisfactory recovery of silica is obtained only from silicates rich in silica and that satisfactory recovery of Mn oxide is not obtained by this method. WAT (14)

Surface Effects on Assay Beads caused by Metals of the Platinum Group. J. L. BYERS. *Bulletin Michigan College of Mining & Technology*, Vol. 6, Jan. 1933, pages 1-17. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 331. Ha (14)

The Determination of Zinc in Aluminum and Aluminum Alloys. (Zur Bestimmung von Zink in Aluminium und Aluminiumlegierungen.) H. WAGNER & H. KOLB. *Chemiker Zeitung*, Vol. 56, Nov. 9, 1932, pages 890-891. In the determination of Zn by the electrolytic method it is necessary to dissolve the Zn from the electrode and test this solution for Fe. By correcting for Fe good checks can be made. CEM (14)

Electrolytic Determination of Slag in Iron and Steel. (Elektrolytische Schlackenbestimmung in Eisen und Stahl.) H. WENTRUP. *Stahl und Eisen*, Vol. 52, July 14, 1932, pages 691-692. Originally published by R. Treje & C. Benedicks in *Jernkontorets Annaler*, Vol. 116, 1932, pages 165-196. See "A Method for the Determination of Slags in Low Carbon Iron and Steel," *Metals & Alloys*, Vol. 4, May 1933, page MA 153. DTR (14)

The Preparation of Purified Gold Electrodes for the Spectrograph. THOMAS A. WRIGHT. *Metals & Alloys*, Vol. 3, June 1932, pages 146-150. Describes method of preparing spectroscopically pure Au by alternate reductions from a solution of chloride with SO_2 to exclude Cu, Pb and such, and with oxalic acid to exclude Pd from the resulting sponge. Melting of sponge was done in a graphite crucible of high purity and rolling and wire drawing carried out with equipment carefully cleaned to avoid contamination with other metals. Resulting product was spectroscopically pure and suitable for electrodes in spectroscopic examination of animal tissues for small amounts of Pb, Ag and Cu. WLC (14)

7-Iodo-8-Hydroxyquinoline-5-Sulfonic Acid as a Reagent for the Colorimetric Determination of Ferric Iron. JOHN H. YOE. *Journal American Chemical Society*, Vol. 54, Nov. 1932, pages 4139-4143. The reagent mentioned is very sensitive for the colorimetric determination of ferric Fe. Its yellow aqueous solution changes to blue or green upon addition of ferric ions. It gives no color reaction with ferrous ion nor with a large number of other ions. The reagent is sensitive to one part of Fe in 10 million parts of solution when the observation is made in a 50 ml. Nessler tube. The reaction is best carried out in a solution acid to methyl orange. The color is stable to light but is destroyed by strong acids and bases. Salts that hydrolyze easily or yield colored ions should not be present unless in very low concentration. MEH (14)

Use of Potentiometric Analysis in Steel Plant Laboratories. III. Determination of Iron in Presence of Vanadium and Rapid Determination of Vanadium in Ferro-Vanadium. IV. Determination of Iron in Presence of Chromium in Iron-Chromium Alloys. (Die Anwendung der potentiometrischen Massanalyse im Eisenhüttenlaboratorium. III. Die Bestimmung von Eisen und Vanadin nebeneinander und die Schnellbestimmung des Vanadins im Ferro-vanadin. IV. Die Bestimmung von Eisen und Chrom nebeneinander in Eisen-Chrom-Legierungen.) P. DICKENS & G. THANHEISER. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, No. 12, 1932, pages 169-180. Fe and V can be determined simultaneously by oxidation and reduction methods, and a combination of both methods was developed for determining Fe and Cr at same time. Detailed information is given. 23 references. Ha (14)

The Colorimetric Determination of Iron with α, α′-Dipyridyl (Ueber die colorimetrische Bestimmung von Eisen mit α, α′-Dipyridel). F. FEIGL, P. KRUMHOLZ & H. HAMBURG. *Zeitschrift für analytische Chemie*, Vol. 90, No. 5/6, 1932, pages 199-202. This method produces intensely red complex salts and can be used for determining Fe in pure Fe-solutions as also in presence of Al, Mn, Zn and Hg, but not when colored ions, as for instance Cu, are present. Ha (14)

Australian Chemical Institute. Authorized Methods of Sampling and Analysis. C. E. FAWCETT *et al. Chemical Engineering & Mining Review*, Vol. 25, Oct. 5, 1932, pages 18-30. Methods of sampling are outlined for molten and ingot Cu, electrolytic Cu, wire bars, billets, ingots, etc., and manufactured articles. Analytical methods are described for determining Cu, As, Sb, Sn, Pb, Fe, Zn, Ni, Co, Se, Te, Bi, O, S, Au, and Ag in Cu products. WHB (14)

A Colorimetric Method of Determination of Small Amounts of Tungsten. (Ueber eine kolorimetrische Bestimmungsmethode kleiner Wolframmengen.) F. FEIGL & P. KRUMHOLZ. *Angewandte Chemie*, Vol. 45, Oct. 22, 1932, pages 674-675. By adding stannous chloride to a weakly alkaline solution of tungstate containing sulphocyanate an intense yellow coloring takes place which can be used for quantitative determination of very minute amounts of W. Calibration of a standard solution for comparison is described. Ha (14)

Application of Ceric Sulfate in Volumetric Analysis. X. The Determination of Antimony and Arsenic. N. HOWELL FURMAN. *Journal American Chemical Society*, Vol. 54, Nov. 1932, pages 4235-4238. It has been found that Sb may be determined by titration with standard ceric sulphate at room temperature without addition of a catalyst if 30-50% by volume of HCl (sp. gr. 1.19) is initially present. The method may be applied to the determination of Sb in the presence of a minor amount of As. After the end-point of the oxidation of Sb has been found, iodine monochloride catalyst may be added and the titration with ceric sulphate continued to a second end-point, which corresponds to the completion of the oxidation of the As. MEH (14)

Analytical Determination by weight of Sulphuric Acid in Chromium Bath. (Die gewichtsanalytische Bestimmung der Schwefelsäure im Chrombad.) K. W. FRÖHLICH. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle*, Vol. 5, Mar. 1932, pages 127-131. Methods of determining H_2SO_4 content in Cr baths are discussed and compared critically. An absolutely reliable method was developed as follows: 5 to 10 cc. are taken from bath and 10 cc. concentrated HCl, 5 cc. alcohol, 10 cc. glacial acetic acid, 3 g. sodium acetate free of sulphate added successively. Beaker is heated, at first covered, then open, for at least 30 min. up to almost boiling temperature. Distilled H_2O is added to make up 250 cc., heated again, and 20 cc. of hot, 5% barium chloride solution is stirred in with a glass rod. After letting it stand cold for at least 2 hrs. it is filtered, and filtered precipitate is then dried, ignited and weighed as usual. Ha (14)

Colorimetry of Titanium. II. (Zur Kolorimetric de Titaniums. II.) H. GINSBERG. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 209, Nov. 1932, pages 105-112. Certain discrepancies in determination of small amounts of Ti by colorimetric methods from Lambert-Behr's absorption law could be traced to imperfections in apparatus. It is pointed out that optical influences can change results considerably. Ha (14)

New Method for Determination of Aluminum Oxide in Aluminum Alloys. (Eine neue Methode zur Bestimmung von Aluminiumoxyd in Aluminiumlegierungen.) W. EHRENBERG. *Zeitschrift für analytische Chemie*, Vol. 91, No. 1/2, 1932, pages 1-5. Method consists in separation of metals from Al_2O_3 and Si by a solution of copper chloride. A few examples illustrate the procedure. Ha (14)

Quantitative Determination of Nickel in Nickel Steels by an Electro-Graphic Method. (Quantitative Bestimmung des Nickels in Nickelstählen auf elektro-graphischem Wege.) A. GLAZUNOV & J. KRIVOHLAVY. *Zeitschrift für physikalische Chemie*, Abt. A, Vol. 161, Sept. 1932, pages 373-388. New analytical method is based on electrolysis. Alloy under test is used as anode and a metal plate as cathode. The electrolyte is a glue-free paper soaked with dimethyl-glyoxime. Passing electric current makes Ni-ions enter solution, which causes a pink-red precipitate. Fe-ions are held in solution by addition of acetic acid. Intensity of color effect is colorimetrically compared with a print from a standard sample. By means of a diagram or by mathematical equations Ni-percentage of unknown sample is determined. A qualitative and quantitative determination can be accomplished in a few minutes. Testing method can also be applied to other metal analyses if suitable reagents are employed. EF (14)

Present State of Methods for Determination of Oxygen and Oxides in Iron and Steel. (Etat actuel des méthodes de dosage de l'oxygène et des oxides dans le fer et l'acier.) R. CASTRO & A. PORTEVIN. *Revue de Métallurgie*, Vol. 29, Aug. 1932, pages 414-421; Sept. 1932, pages 449-469; Oct. 1932, pages 492-506; Nov. 1932, pages 553-564. A comprehensive and detailed review of views of different investigators, their methods and apparatus used. Work embraces range from Fresenius to 1932. The O dissolved in Fe is never found in a free state or as an oxide of C. Methods involving volatilization of bulk of Fe do not give accurate results on account of secondary reactions between gases used and constituents of steel. Solution of Fe in different salts gives indifferent results. Electrolytic solution is best of this group. H reduction does not give total amount of oxides present. C reduction is continuously improved. Last of this type is Meyer and Castro apparatus allowing at 2100° C. 0.0001 mm. of Hg pressure which at 1700° C. is reduced to 0.00005 mm. Paper is based on 231 references. JDG (14)

Determination of Barium in Iron Ores (Sur le dosage du baryum dans les minerais de fer). ED. CHAUVENET & AVRARD. *Comptes Rendus*, Vol. 195, July 25, 1932, pages 331-332. Ore is exposed to CCl_4 at 900°-930° C., about 0.5 g. of powdered ore being placed in a boat contained in a heated tube through which the vapor circulates. After 40-50 minutes, remove and repowder the substance, re-introduce it and expose for the same length of time again. There is quantitative transformation of the constituents (except Si) into chlorides, many of which are volatile. The $BaCl_2$ remains in the boat and can be extracted by water; the insoluble Si remains. Fe is best estimated by a separate Zimmerman-Reinhardt test. Method is specially recommended for Ba. OWE (14)

Separation and Determination of Cu in Presence of Al Using 8-Hydroxyquinolin. Application to Alloys of Al (Séparation et détermination du cuivre en présence d' aluminium par la 8-hydroxyquinoléine. Application aux alliages d' aluminium). JEAN CALVET. *Comptes Rendus*, Vol. 195, July 11, 1932, pages 148-150. In presence of Na tartrate in an ammoniacal or acetic acid solution small quantities of hydroxyquinolin give no precipitate with large quantities of Al, but any Cu in solution is deposited completely. Examples of analyses carried out in this way are given. Method is rapid and precision superior to that of electrolytic processes. OWE (14)

Potentiometric (Galvanometric) Method for Volumetric Analysis. N. YA. CHLOPIN. *Vestnik Metallopromishlennosti*, (*Metal Industry Herald*), Vol. 12, Feb. 1932, pages 6-18. (In Russian.) Advocates the potentiometric titration using Pt-W electrodes. Proposes a method for volumetric determination of V in alloy steels using $(NH_4)S_2O_8$ oxidation. (14)

Microchemical Methods in the Steel Industry. (Om användning av mikrokemiska arbetsmetoder inom järnindustrin.) HERBERT ALBER. *Jernkontorets Annaler*, Vol. 114, Nov. 1932, pages 519-537. Discussion of qualitative and quantitative technique. 67 references. HCD (14)

Spectral Analysis (Spektralanalyse). G. HEIDHAUSEN. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns*, Vol. 2, Oct. 1932, pages 62-78. Advantages which the spectral analysis offers in chemical material testing are explained in great length. A very simple apparatus is described which can be used for all practical purposes in a plant laboratory. The Fe spectrum is described and spectrum photographs given which can be used as standards for determining the eventual components of other materials. It is shown how not only qualitative, but also quantitative determinations of elements can be made within very narrow limits. The whole procedure is illustrated by several examples and a normal spark spectrum of Fe is given. Ha (14)

Direct Gravimetric Determination of Sodium in Commercial Aluminum. EARLE R. CALEY. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 4, July 15, 1932, pages 340-341. Use of Mg uranyl acetate reagent is recommended for determination of Na in Al when Na is present in quantities greater than 0.01%. MEH (14)

Electrometric Titration of Nickel in Steel. (Elektrometrische Titration von Nickel in Stahl.) W. BOHNHOLTZER. *Zeitschrift für analytische Chemie*, Vol. 87, No. 11/12, 1932, pages 401-415. Quick potentiometric determination of Ni in steel based on KCN titration method of Moore is described and application illustrated. Ha (14)

Quantitative Determination of Calcium by the Magneto-Optic Method. EDNA R. BISHOP & C. B. DOLLINS. *Journal American Chemical Society*, Vol. 54, Dec. 1932, pages 4585-4588. Magneto-optic method for quantitative determination of Ca is outlined. MEH (14)

The Simultaneous Electrolytic Determination of Lead and Copper. (Ueber gemeinsame elektrolytische Bestimmung von Blei und Kupfer.) H. BILTZ. *Zeitschrift für analytische Chemie*, Vol. 90, No. 7/8, 1932, pages 277-278. Addition of urea to a nitric solution is recommended for simultaneous determination of Cu and Pb. This is applicable for amounts of Pb as small as 0.5 g. It is pointed out that this method was mentioned several years ago. Ha (14)

Rinnmann's Green Test for Zinc. A. A. BENEDETTI-PICHLER. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 4, July 15, 1932, pages 336-337. Rinnmann's green test for Zn can be carried out very simply by placing a drop of test solution on a piece of filter paper impregnated previously with potassium cobalticyanide, drying, and ashing paper. 0.0006 mg. of Zn still produces a disk of green ash on spot where solution had been added. Test is best carried out with a solution obtained by dissolving the ZnS precipitated in analysis in HNO_3. Some limiting proportions for presence of other metals are given. MEH (14)

A Gravimetric Method for the Separation and Determination of Titanium.) HAL TRUEMAN BEANS & DOROTHEA R. MOSSMAN. *Journal American Chemical Society*, Vol. 54, May 1932, pages 1905-1911. A new gravimetric method for the determination of Ti is described. The Ti is precipitated as a double KTi-iodate. Ti is quantitatively separated from Al, Ca, Mg, Ni, P and Cr, and with slight modifications of the method, also from Zr and Mn. Fe must be previously removed. A procedure for the separation and determination of small amounts of Zr from large amounts of Ti is also described. MEH (14)

Determination of Sodium in Aluminum. I. Chemical Analysis. R. W. BRIDGES & M. F. LEE. **II. Spectrographic Analysis.** A. W. PETREY. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 24, July 15, 1932, pages 264-267. A fusion-leach method, useful over range of 0.001 to 0.05% Na, is described. Arc excitation of metal between graphite electrodes, using solid standards of Al with known Na content, and a Littrow auto-collimating spectrograph with a quartz optical system, is second method described. 27 references. MEH (14)

Colorimetric Tests for Precious Metals. W. E. JOHN & E. BEYERS. *Journal Chemical, Metallurgical & Mining Society of South Africa*, Vol. 33, Aug. 1932, pages 26-27. Dissolve material in aqua regia, avoiding solution of excessive Fe. Cool and add $SnCl_2$. Add 1/3 quantity of ether and shake. Purple of Cassius is removed and remains as a black scum on ether-H_2O interface. Au may spread up side of test tube in ether layer. Platinoid color will be concentrated and taken up completely by ether and depth of color will give some indication of its concentration. For Pd, ether color is red. Fe fully reduced will give no color; in large quantities it gives a dirty brown which interferes with platinoid color. Hg remains with Au, but color is distinctive. Ag will not be taken into ether. AHE (14)

On the Gravimetric Determination of Beryllium and Its Separation from Aluminum by Guanidine Carbonate. (Ueber die gewichtsanalytische Bestimmung des Berylliums und seine Trennung von Aluminium durch Guanidincarbonat.) A. JILEK & J. KOTA. *Zeitschrift für analytische Chemie*, Vol. 87, No. 11/12, 1932, pages 422-437. Method for determination of Be in presence of Al is described and a modification if ammonium salts of unknown concentration are present. Ha (14)

The Behavior of Oxide-containing Iron in a Stream of Chlorine. (Das Verhalten von oxydhaltigem Eisen im Chlorstrom.) OSKAR MEYER. *Archiv für das Eisenhüttenwesen*, Vol. 6, Nov. 1932, pages 193-197. Influence of time, duration of chlorination and rate of gas on the determination of oxide, decrease of chlorination rate by use of Cl-N mixtures and a fundamental consideration of accuracy and applicability of customary residue method with especial consideration of size of inclusions are discussed. It is concluded that chlorination investigations of Fe-O melts show that chlorination method is not suitable for the determination of O combined with the Fe. Chlorination at low temperatures and the dilution of Cl by O can not fully prevent an exchange between Cl and oxide inclusions. Influence of size of particle of oxide inclusions, neglected so far, on the applicability and accuracy of the so-called residue method is described and a check of the method along this line is necessary. MGL (14)

Electrolytic Determination of Bismuth in Alloys with Lead. (Determinazione elettrolitica del bismuto in lega col piombo.) L. LUCCHI & A. BARTOCCI. *Annali di chimica applicata*, Vol. 22, July 1932, pages 509-511. This is a modification of method of Brunck (Classen, Quantitative Analysis by Electrolysis). Enough alloy is dissolved in HNO_3 to give 0.1-0.2 g. Bi. Solution is evaporated to 2-3 cc. diluted, and Pb precipitated with 3 cc. H_2SO_4, excess acid being precipitated with $Ba(OH)_2$. Solution is then acidified with HNO_3 and electrolysed using Pt electrodes. To obtain a bright deposit of Bi, less than 2% excess HNO_3 should be present. Current of 0.1 amps. at 1.8-1.9 V. is used. AWC (14)

Volumetric Determination of Cerium by Arsenious Acid. (Volumetrische Bestimmung von Cer mit arseniger Säure.) RUD. LANG & J. ZWERINA. *Zeitschrift für analytische Chemie*, Vol. 91, No. 1/2, 1932, pages 5-12. Detailed description of chemical and potentiometric methods. Ha (14)

Some New Methods for Rapid Analysis of Steel. G. I. LUKIANCHENKO. *Domez*, No. 7, 1932, pages 57-58. (In Russian). G. Misson'method of colorimetric P determination (*Chemiker Zeitung*, Vol. 32, page 633) was found to be entirely satisfactory for rapid and accurate determination of P. 1 g. sample is dissolved in 20 ml. HNO_3, heated to boiling. 10 ml. of 0.8% solution of $KMnO_4$ are added and boiling continued for 2 minutes. Precipitate of MnO_2 is dissolved with H_2O_2 added by drops. Exactly 10 ml. of vanadate solution (2.345 gr. NH_4VO_4 and 20 ml. HNO_3 to a liter) are added. H_2O_2 is boiled off. Cool. Transfer to 100 ml. measuring flask, fill to mark with H_2O and compare with a standard in a colorimeter. Standards kept well for 10 days. Analysis takes 12-15 minutes. Using Maag and McCollam's method for colorimetric determination of Mo (*Industrial & Engineering Chemistry*, Vol. 15, 1923, page 350) somewhat better results are obtained after replacing easily volatile ether with isoamyl alcohol or butyl acetate. (14)

Analysis of Free Cyanide in Brass Plating Baths. L. C. PAN. *Metal Industry*, N. Y., Vol. 30, Oct. 1932, pages 402-404; Nov. 1932, pages 438-439. Includes bibliography. Free cyanide in brass plating solution is excess NaCN above what is required by Cu and Zn cyanide to form $Na_2Cu(CN)_3$ and $NaZn(CN)_3$, but not $NaCu(CN)_2$ or $Na_2Zn(CN)_4$. 4 methods of analysis were studied (1) Liebig, (2) $AgNO_3$ titration with small amount of KI indicator, (3) $AgNO_3$ titration with large amount of KI indicator, (4) Titration against standard $CuSO_4$ solution. With method (1) dilution first lowers then raises free cyanide value. Under conditions similar to those used, a dilution of 8 (or 80 ml. at end of titration on a 10 ml. sample) gives best results. Effect of carbonate is small. Effect of ammonia amounts to an apparent increase of free cyanide content of 0.04 g./l. for every ml. of concentrated ammonia water in a l. of brass solution. Ammonia interference is chief objection to using original Liebig method. In methods (2) and (3), presence of KI first increases results of titration sharply up to a maximum at 0.5 g., then decreases to a minimum at 4.3 g. and then increases again. End point of titration is much sharper with high concentration of KI. Accuracy of method (4) is only fair and end point lags in time. In all 4 methods dilution is important and all analyses should be made at a fixed volume and if KI is to be used with $AgNO_3$ titration, it should be used in fixed amounts—0.37*N* or 4.3g. and a total volume of titration mixture of 70 ml. PRK (14)

Gravimetric Determination of Aluminum by means of the Sulphocyanate Method. Separation of Aluminum from Manganese and Zinc. (Gravimetrische Aluminiumbestimmung mittels der Rhodanid-Methode. Trennung vom Mangan und Zink.) A. OKAC. *Sprechsaal für Keramik, Glas, Email*, Vol. 65, Sept. 29, 1932, page 709. For separating Al^{+++} from Mn^{++}, 2 cc. of 2*N* NH_4Cl solution + .1-.3 g. KCNS are added to the neutral solution. Upon boiling and filtrating the separated $Al(OH)_3$ is washed with hot H_2O. For separating Al^{+++} from Zn^{++}, 50 cc. of 2*N* NH_4Cl solution + .1-.3 g. KCNS are added to 100 cc. of the solution (5-30 mg. Al + 5-150 mg. Zn) to be further treated as above described. GN (14)

Estimation of Small Amounts of Iron in Copper. BART PARK. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 4, July 15, 1932, pages 247-248. Results of this study show that it is advisable to wash samples of Cu with dilute HCl when an accurate determination of Fe is desired. MEH (14)

The Determination of Copper in the Presence of Iron with Salicylaldoxime. (Die Bestimmung des Kupfers neben Eisen mit Salicylaldoxim.) WILHELM REIF. *Zeitschrift für analytische Chemie*, Vol. 88, No. 1/2, 1932, pages 38-40. Method described permits a ready determination of Cu in presence of Fe and of ammonium salts. Ha (14)

Detection of Beryllium in Minerals. (Nachweis des Berylliums in Gesteinen.) GÜNTHER RIENÄCKER. *Zeitschrift für analytische Chemie*, Vol. 88, No. 1/2, 1932, pages 29-38. Experiments described show that Fischer's quinalizarin test is sensitive and that inaccuracies due to presence of other substances can be taken care of by NaOH. Be is determined as beryllate. Method for a rapid test is given which permits determining as little as 0.01% Be in 0.1 g. sample. Blue dye solution in OH- solutions is formed. Ha (14)

Separation of Hafnium and Zirconium (Ueber die Trennung von Hafnium und Zirkonium). WILH. PRANDTL. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 208, Nov. 1932, pages 420-426. Difficult separation of 2 very similar elements Hf and Zr can be effected by ferrocyanide. Ha (14)

Microdocimastic Enrichment and Spectro-analytical Determination of Noble Metals. (Mikrodokimastische Anreicherung und spektralanalytische Bestimmung der Edelmetalle.) CL. PETERS. *Metallwirtschaft*, Vol. 12, Jan. 13, 1933, pages 17-19. A combination of the microdocimastic method of cupellation with Pb and spectrographic identification has been perfected for the determination of very small amounts of Au, Ag and the Pt group metals. The method is very accurate and does not take much time. A .5 g. sample is fused with a mixture of Pb acetate, K_2CO_3, Na_2CO_3, SiO_2 and borax. If the sample contains S or As it is first roasted at 700-800° C. The resulting Pb button is then heated until its size is reduced to 1.5 to 2 mm. dia. By not driving the Pb off completely there is no loss of Os or Ru. The remaining button is used for the spectrographic determination. C electrodes, which have been heated to 2800° C. in N_2 with a little H_2, are used. The sample is volatilized in 7 arcing periods of 20 sec. duration with 5 sec. intervals. The elements volatilize in the order of their boiling points. A variation in the weight of the Pb button from 20 to 35 mg. has no effect on the results. By this method the minimum quantities of metals which can be determined are: .1 g./ton of Ag, .2 g./ton of Rh, Pd, Pt and Au, .5g./ton of Ru, 1 g./ton of Ir, and 5 g./ton of Os. The portion of the spectrum used is between 2600 and 3700 A.U. 7 references. CEM (14)

A New Rapid Method for the Macro-and Microchemical determination of Silver (Eine neue Schnellmethode zur makro-und mikrochemischen Bestimmung des Silbers). G. SPACU & P. SPACU. *Zeitschrift für analytische Chemie*, Vol. 90, No. 5/6, 1932, pages 182-185. Method consists in formation of a complex AgI_2-combination insoluble in alcohol, ether and other solvents and which is used for the exact determination of Ag. This method has shown to be superior to old method of producing halogen-silver. Ha (14)

HISTORICAL & BIOGRAPHICAL (15)

Construction Steels and their Development. (Om konstruktionsstalen och deras utveckling.) ARVID JOHANNSON. *Jernkontorets Annaler*, Vol. 116, July 1932, pages 293-321. Historical discussion with summary of characteristic properties. HCD (15)

Enamel (Email). CURT HASENOHR. *Deutsche Goldschmiedezeitung*, Vol. 35, July 16, 1932, pages 292-293; July 30, 1932, pages 308-309; Aug. 13, 1932, pages 328-329. The paper gives an interesting account of the history of enameling. The oldest enameled articles are of Egyptian origin and date back to 1400 B.C. The art of enameling flourished in Constantinople from the 5th to the 10th century A.D., in Germany and France, which led in this field in Europe, from the 10th to the 12th century. The various types of enamels made are described. The future of present enameling is discussed. GN (15)

Evolution of Modern Chromium Plating. (Die Anfänge der modernen Verchromung.) SCHÖPFF. *Metallwaren Industries und Galvano-Technik*, Vol. 29, Oct. 19, 1931, pages 429-430. The historical development of Cr plating technique is traced. EF (15)

The Cambria Iron Company, The First Steel Chemist and Beginnings of Bessemer Steel. L. W. SPRING & L. E. GILMORE. *Metals & Alloys*, Vol. 3, Apr. 1932, pages 93-96. An historical sketch of the beginnings of Bessemer Steel in America with notes on the lives of prominent actors in the development of the American Steel Industry. WLC (15)

The Manufacture of Steel Sheets. JAMES BRYDEN. *Journal West of Scotland Iron & Steel Institute*, Vol. 39, Part IV, Jan. 1931-2 Session, pages 51-68. The first sheets produced with the help of mechanical appliances are said to have been produced in the 14th century, water driven hammers being used about that time. The outstanding development associated with the names of John Hansbury and John Payne was the use, in 1728, for the first time of rolls for producing sheets. The modern orthodox methods of manufacturing of steel sheets as practiced in England are fully described in the following topics: Raw materials, Plant, which includes the heating furnaces, motive power unit, hot mills, hot mills auxiliary, pickling equipment, cold rolls, close annealing furnaces, finishing equipment. Recent developments in United States are also discussed. GTM (15)

Some Bronze Specimens from the Royal Graves at Ur. C. F. ELAM. *Journal Institute of Metals*, Vol. 48, 1932, pages 97-108. Includes discussion. See *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 49. (15)

Lead from an Old Roman Coffin at Arles. JEROME ALEXANDER & THOMAS A. WRIGHT. *Journal Society of Chemical Industry*, Vol. 51, Sept. 30, 1932, pages 813-814. A piece from a lead coffin found at Arles, France, said to date from Roman times, was analyzed spectroscopically. It was apparently made from an alloy of 95% Pb and 5% Sn, metals being surprisingly pure. Other metals present were Sb, not over .50%, Cu .1%, Zn, Mg, and Bi less than third decimal place, Ag not over .01%, As not detected. VVK (15)

History of Direct Iron and Steel Production from 1925 to the Present Day. (Geschichte der direkten Eisen- und Stahlerzeugung in der Zeit vom Jahre 1925 bis zur Gegenwart.) HCH. LEOBNER. *Montanistische Rundschau*, Vol. 24, Oct. 16, 1932, pages 1-7. Various methods of direct steel production suggested and tried during that time are briefly described, dealing with (1) production of Fe sponge from ore, (2) direct production of soft Fe or steel in fused state from ores or salts, (3) direct production of these metals by electrolysis. Detailed survey of literature is appended. GN (15)

Early Development of Enameling in the United States. H. M. REED. *Better Enameling*, Vol. 3, Dec. 1932, pages 4-6, 31. About 1870 cast Fe bath tubs with fused vitreous enamel coating were manufactured at Philadelphia with an output of one tub per day. Crude production methods of that day are described. Development in castings production and enameling are traced. CBJ (15)

The Story of Early Metallurgy. X. Irish Gold. R. T. ROLFE. *Metal Industry*, London, Vol. 41, Oct. 7, 1932, pages 341-344. Historical record of gold finds and methods of recovering from the sands in Ireland from olden times up to 1840. Ha (15)

Make Early Steel History in Milwaukee. CHARLES VICKERS. *Foundry*, Vol. 60, Jan. 1, 1932, pages 36-38; Jan. 15, 1932, pages 25-28. Historical. VSP (15)

Electric Pig Iron and Electric Steel. (Elektroeisen und Elektrostahl.) *Kali, Erz und Kohle*, Vol. 29, Oct. 10, 1932, pages 161-162. An historical account of production of Fe in the electric blast furnace and of electric steel melting processes. Data are given on the economic development of various types of electric steel melting furnaces in Fe producing countries. A table shows production of electric steel in these countries from 1922-1929. GN (15)

Old and New Welded Ornamental Work. (Alte und neue geschweisste Kunstschmiedearbeiten.) HERM. RICHTER. *Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens mittels Sauerstoff und Azetylen*, Series 7, 1932, pages 7-12. See *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 49. Ha (15)

Man and Metals. T. A. RICKARD. 2 Vols. Whittlesey House (McGraw-Hill Book Company), New York, 1932. Cloth, 6½ x 9¼ inches, 1068 pages. Price $10.00. Available historical facts and reasonable assumptions based on them are woven together into a connected story of the development of metal mining and smelting from the earliest days. It is primarily an antiquarian's book. The economic effect of the availability of metals is considered throughout, the idea being to trace the relation of mining to civilization. It is interesting reading for any metallurgist. The illustrations and book-making are good. H. W. Gillett (15)-B-

Some Very Old Formulas for Preparing Copper Alloys. (Quelques tres Anciennes Formules de Preparation d'Alliages Cuporques.) A. CHAPLET. *Cuivre et Laiton*, Vol. 5, Apr. 30, 1932, page 187. Formulas from old manuscripts for bronzes are reproduced and explained. Ha (15)

Metals in the Use of Man. C. H. DESCH. *Scientific Monthly*, June 1932, pages 550-552. A brief historic review is given of how the metals gradually came to be used by man and how they were worked. The first metal ever used was Au; Cu and Ag followed. The invention of bronze occurred about 3500 B.C., while iron came into use about 1500 B.C. Ha (15)

The Rise and Early Development of Electrodeposition. R. S. HUTTON. *Preprint, Electroplaters & Depositors' Technical Society*, London, Sept. 1931, pages 78-82. Although isolated experiments of electrodeposition were reported previously, the foundation of electrodeposition of metals were laid by Michael Faraday (1791-1867) who in 1831 discovered the electromagnetic induction and during 1833-4 enunciated the laws of electrolysis. The outstanding events that led to the present vast electroplating and electrometallurgical industries are given. World's production of metals by electrolysis and total electric energy consumed for this purpose are also given. LCP (15)

Development of High Grade Sheet Rolling Mill. (Die Entwicklung des Feinblechwalzwerkes.) WILLIAM KRÄMER. *Stahl und Eisen*, Vol. 52, May 5, 1932, pages 439-443. Discussion of progress in the development of sheet mills producing high grade material is given for past decade. Particular stress is laid on roll housings, methods of operation, and arrangement of stands with respect to furnaces and conveyors. Suggestions made for future extension. 12 diagrammatic sketches give different arrangements of sheet furnaces, breakdown and finishing mills. DTR (15)

Steel as Construction Material in the Present and Future. (Der Stahl als Baustoff in Gegenwart und Zukunft.) F. BRUNNER. *Stahlbautechnik*, Supplement to *Montanistische Rundschau*, Vol. 24, May 1932, pages 1-5. The paper gives a historical survey on the application of steel to structural purposes with special reference to its use for house and bridge building. GN (15)

ECONOMIC (16)

Antimony in 1931. PAUL M. TYLER. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Oct. 31, 1932, pages 51-69. Imports of Sb in ore increased from 863 to 4863 short tons, while imports of Sb metal decreased from 7700 to 3753 tons. Oxide increased from 690 to 746 but liquated Sb_2S_3 decreased from 713 to 650 tons. Exports of foreign Sb was 697 tons, 493 in 1930. Stocks were stationary. Antimonial Pb produced from domestic and foreign ores contained 964 tons of Sb, 1685 in 1930. Secondary Sb amounted to 8082 tons in 1930 and 7900 tons in 1931. AHE (16)

Daily Calculations of Wages and Auxiliary Material in Works Operation. (Tägliche Abrechnung der Löhne und Hilfsstoffe in einem Hüttenbetrieb.) GOTTFRIED VEIT. *Archiv für Eisenhuttenwesen,* Vol. 6, Nov. 1932, pages 215-220. Discusses daily determination, distribution and calculation of wages. MGL (16)

Algerian Mercury. *La Revue des Produits Chimiques,* Vol. 35, Mar. 15, 1932, pages 139-140; *Chemical Trade Journal & Chemical Engineer,* Vol. 90, Apr. 1, 1932, page 340. Report of progress being made by La Societe de Mines de Ras-el-Ma in developing deposits of Cinnabar in a concession in Ras-el-Ma district of Algeria. Mineral is mercury sulphide with marl, lime and sandstone impurities. It averages about 5 kg. Hg/ton of ore. JN (16)

Chrome Ore From Russia. *Chemical Trade Journal & Chemical Engineer,* Vol. 90, Apr. 22, 1932, page 401. Abstract of article in *Commerce Reports,* Apr. 4, 1932, pages 28-29. Soviet Russia possesses chromite reserves in Urals estimated at 6,000,000 metric tons. It produced 10.8% of world's total, or 66,720 tons, in 1929-30. About 25% of present production is shipped to U. S. World consumption of chromite has doubled in past few years in spite of a 50% drop in steel output. JN (16)

The Foundry Industry Now and After the Depression—A Symposium. *Iron Age,* Vol. 129, May 19, 1932, pages 1100-1105, 1116. To obtain authoritative information regarding effect of present conditions on foundry industry, views of some representative men were solicited for following symposium: The Foundry Industry as a Whole by T. S. Hammond; Non-ferrous Castings by N. K. B. Patch; High Test and Alloy Iron by J. W. Bolton; Development in Gray Iron by H. Bornstein; Alloy Steel Castings by A. W. Lorenz; Effect of the Depression on the Electric Steel Casting Industry by R. A. Bull; Development and Use of Foundry Cost Systems by A. E. Grover; Trend in Foundry Construction by Frank D. Chase; Steel Foundries gird themselves for Future by Granville P. Rogers; Electric Furnaces in the Foundry by G. L. Simpson; and Development in the Gray Iron by A. T. Tuscany. VSP (16)

Recent Developments in Electrolytic Zinc. (Developpements recents de l'industrie du zinc electrolytique.) *Journal du Four Electrique,* Vol. 41, June 1932, pages 205-206. A condensation of A. Zentner's paper before the American Zinc Institute. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 21. JDG (16)

The Mineral Production of India During 1930. L. LEIGH FERMOR. *Records of the Geological Survey of India,* Vol. 65, Pt. 3, Oct. 1931, pages 315-393. Mineral production of India in 1930 decreased 11.1% to £19,750,233. Production figures are given and the industry briefly discussed for each of the following minerals of metallurgical interest, which are arranged in decreasing order of value of 1930 production, the figures in ( ) being comparison with 1929: Coal (+2.9%), Au (—10.2), Pb and Pb-ore (—27.1), Mn ore (—23.6), Ag (—28.9), Cu ore and matte (+7.9), Fe ore (—25.5), Sn ore (—24.6), Zn concentrate (—53.3), W ore (+18.4), chromite (+2.3), Ni speiss (+12.9), ilmenite (+15.4), antimonial Pb (+4.6), refractory materials (+114.9), magnesite (—36.3), bauxite (—72.4), monazite (—92.2), Bi (+4.3), and Sb ore (—94.6). AHE (16)

Instability of Fuel Prices Delays Plant Improvements Correspondence from F. GIOLITTI. *Metal Progress,* Vol. 21, May 1932 pages 67-68. Writer comments upon the effect of economic unsettlement in delaying installation of improved equipment. WLC (16)

Silver, Copper, Lead, and Zinc in the Central States in 1931—Advance Summary. J. P. DUNLOP. *United States Bureau of Mines, Mineral Market Reports.* No. M.M.S. 123, June 15, 1932, 4 pages. Production for 1930 and 1931, respectively, in the Central States was: Ag 179,827, and 42,737 oz., value $69,234 and $12,394; Cu (Mich.) 84,779 and 59,030 tons, value $22,042,542 and $10,743,414; Pb 237,533 and 181,648 tons, value $23,753,300 and $13,441,952; Zn 233,835 and 130,476 tons, value $22,448,160 and $9,916,176; total $68,-313,236 and $34,113,936. AHE (16)

Mine Production of Gold, Silver, Copper, Lead and Zinc in Montana in 1931, by Counties. C. N. GERRY. *United States Bureau of Mines, Mineral Market Reports.* No. M.M.S. 139, Aug. 3, 1932, 1 page. Output of Au, Ag, Cu, Pb, and Zn in Mont. in 1931 (and 1930) was: Au 40,112.16 oz. (43,489.17 oz.), Ag 3,829,837 oz. (7,052,889 oz.), Cu 184,555,735 lbs. (196,187,523 lbs.), Pb 8,860,186 lbs. (21,306,044 lbs.), Zn 13,494,986 lbs. (52,841,108 lbs.) and total value $19,575,053 ($32,720,416). AHE (16)

Gold, Silver, Copper, Lead and Zinc in Washington in 1930. C. N. GERRY & T. H. MILLER. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, Part 1, June 20, 1932, pages 661-677. The value of the mine production of Au, Ag, Cu, Pb and Zn in Washington decreased from $552,233 in 1929 to $348,630 in 1930, less than ½ the yearly average for the decade 1921-1930. Au output increased from 3,719.94 oz. to 4,244.81 oz., but was still below the decade average. Ag production was 32,816 oz., the lowest since 1894. Cu production decreased 14% to 1,206,438 lbs., more than the decade average. Pb increased 13% to 1,152,585 lbs., still only about ½ the yearly average for the past 10 years. Zn output was 703,782 lbs., less than 1/3 the 1929 output. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Idaho in 1930. C. N. GERRY & T. H. MILLER. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, Part 1, June 20, 1932, pages 611-660. The value of Au, Ag, Cu, Pb and Zn production in Idaho in 1930 decreased to $21,494,867 from $31,104,246. Au output increased nearly 6% to 21,445.07 oz. Ag production was 9,420,639 oz., the largest since 1917, and the second most important state. Cu production decreased more than 39% to 3,111,555 lbs. Pb decreased nearly 10% to 268,115,963 lbs., the second ranking state. Zn output of 1929 to 75,-298,172 lbs. Production of Cu, Pb and Zn was above the average annual output for the decade 1921-1930. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Utah in 1930. C. N. GERRY & PAUL LUFF. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, Part 1, June 20, 1932, pages 555-609. The output of Au, Ag, Cu, Pb and Zn in Utah in 1930 was valued at $48,653,464, as compared with $95,985,201 in 1929. Au production (208,455.03 oz.) decreased 13%. Utah was the leading Ag producer with 13,129,421 oz. worth $5,054,827, a decrease of more than 4,000,000 oz. and the lowest output since 1921. The state dropped to third place in Cu production, which decreased 43% to 180,526,423 lbs., worth $23,468,435. Pb output decreased 22% to 230,989,780 lbs. worth $11,549,489, the third largest state production. Utah Zn production decreased 14,028,547 lbs. from the record output of 1929 to 88,990,938 lbs. worth $4,271,565, fourth among the states. AHE (16)

Production of Gold, Silver, Copper, Lead and Zinc in Arizona in 1931. C. N. GERRY. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 126, June 29, 1932, 1 page. The production of Au, Ag, Cu, Pb and Zn in Ariz. in 1931 (and comparison with 1930) is as follows: Au 126,185.94 oz. (169,390.38), Ag 3,245,311 oz. (5,540,732), Cu 401,344,909 lbs. (576,-190,607), Pb 1,964,112 lbs. (8,491,623), Zn (1,630,506 lbs.), and total value $40,144,694 ($81,042,416). AHE (16)

Economic Production of Shovels, Spades and Rakes. (Wirtschaftliche Herstellung von Schaufeln, Spaten und Rechen.) H. POHLANDT. *Zeitschrift für wirtschaftliche Fertigung,* Jan. 1933, 2 pages. Selection of material and methods of production are considered with due consideration of application and economy of production. GN (16)

Makers of Stainless Castings. Correspondence from B. F. SHEPHERD. *Metal Progress,* Vol. 22, July 1932, page 54. Lists foundries making high Cr alloy castings. Licensing organizations, and firms using high frequency induction furnaces are indicated. WLC (16)

Buying and Selling Time. *Welding,* Vol. 3, Nov. 1932, pages 627-628. By means of a mechanical computing device, the operator of a welding shop is able to buy and sell operator's time with absolute accuracy. TEJ (16)

Ontario as a Metal Producer. T. F. SUTHERLAND. *Sands, Clays & Minerals,* Vol. 1, Sept. 1932, pages 26-28. Metal resources of Province of Ontario, Canada, are described. Among them are Au, Ni-Cu and Ag-Co; 98% of world production of Ni is supplied from there. Pt amounted to 11,645 oz. in 1931, Au to 23,381 oz. and Ag to 822,972 oz. Methods of mining and location of mines are briefly described. Ha (16)

Tin Producers to Study New and Old Uses. Correspondence from L. J. TAVENER. *Metal Progress,* Vol. 21, June 1932, pages 55-56. Relates purposes and activities of International Tin Committee formed last year by delegates appointed by governments of Malaya, Nigeria, Dutch East Indies, Bolivia and Siam, which together have control of 95% of world's Sn production. Committee has devised a quota scheme which has succeeded in limiting production in accordance with decreased consumption. Member governments have subscribed to a fund for research. WLC (16)

The Mineral Industry during 1931. Vol. XL. Edited by G. A. ROUSH. McGraw-Hill Book Co., New York, 1932. Cloth, 6½ x 9½ inches, 735 pages. Price $12.00. This volume completes the 40th year of its service to the mineral industry and is the 19th volume which has appeared under the able direction of Mr. Roush. The Mineral Industry presents a summary of the statistical and technical progress in each of the important branches of the industry. In order that reports may present authoritatively the conditions prevailing in the various branches of the industry, the editor places their preparation in the hands of men familiar with the industry covered by the report, who are able to evaluate the individual items in the mass of information collected in the course of a year. This volume, as with its predecessors, includes statistics on production and trade, technical progress, extensions of plants, new sources and uses, market conditions and prices. M. L. Moorman (16)-B-

The Future of Gold. (Zukunft des Goldes.) H. JOACHIM, *Die Umschau in Wissenschaft und Technik,* Vol. 36, Feb. 6, 1932, page 115. Production figures and actual need are compared. Writer arrives at the conclusion that Au is not fitted for a basis of the world's monetary system. EF (16)

The Perforated Card System as an Auxiliary in the Utilization of Time Studies. (Das Lochkartenverfahren als Hilfsmittel bei der Auswertung von Zeitstudien.) MARTIN FÖRSTER. *Archiv für das Eisenhüttenwesen,* Vol. 5, Dec. 1931, pages 331-334. Report 53 of Committee on Economy of Operation of Verein deutscher Eisenhüttenleute. After a short discussion on the use of time studies, a general description is given of the performed card system in mill practice, together with a practical operating example. The perforated cards show all the halts and interruptions in production, according to furnaces and ingot weight. DTR (16)

How Much Does It Cost to Train Foundry Apprentices? J. FRANKLIN CARLY. *Transactions American Foundrymen's Association,* Vol. 3, July-Aug. 1932, pages 217-229. Costs of training are given. CHL (16)

Copper Industry in 1932—Advance Summary. H. M. MEYER. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 159, Jan. 5, 1933, 3 pages. Smelter output of Cu from ores of domestic origin in 1932 (about 528,000,000 lbs.) was about ½ that of 1931 and refinery production from domestic and foreign sources (about 688,000,000 lbs.) was 54% lower. Consumption declined and stocks increased 7%. Production of secondary Cu declined from 156,000,000 lbs. in 1931 to about 120,000,000 lbs. in 1932. Total output of Cu (about 808,000,000 lbs.) was 51% less than 1931. Imports decreased about 35%. Exports declined sharply. AHE (16)

Copper in 1930. C. E. JULIHN & H. M. MEYER. *United States Bureau of Mines, Mineral Resources of the United States,* 1930, part 1, Aug. 19, 1932, pages 691-748. World production of new Cu was 1,573,000 metric tons, a decline of 17% from 1929. Production in the western hemisphere declined 23.3%, while that in the rest of the world increased 3.6%. In N. America the decline was 21.7% (U. S. 27%, Mexico 8.3% and Canadian increase of 40%) and S. America 28.5%. The increase in Africa was 1.5%, Europe 3.0%, Asia 4.2% and Australia 37%. Distribution of world production was N. America 56.22%, S. America 16.23%, Europe 11.49%, Africa 9.72%, Asia 5.38% and Australia 0.96%. The world mine production and smelter output are given by continents and countries. Figures for 1929 and 1930 by companies are tabulated and show that the 3 largest groups in the Americas carried the burden of world curtailment; Anaconda, Kennecott and Phelps Dodge curtailed more than 369,000 short tons as compared with a world cut of 366,000 tons. Stocks increased 29.3%. Consumption declined 18.7%. Detailed domestic figures by state, districts, kind of ore, product, etc., are given. AHE (16)

Analysis of U. S. Imports of Iron and Steel Products. J. JOS. W. PALMER. *American Metal Market,* Vol. 39, Aug. 25, 1932, page 6. Discussion of products imported into the U. S. for 1st half 1932. DTR (16)

Mineral Production of Yugoslavia in 1931. T. LANDELL MILLS. *Mining Journal,* London, Vol. 178, Aug. 6, 1932, page 544. Pb ore production increased 100% to 371,172 tons averaging 11% Pb. Output of Cr ore increased slightly to 57,172 tons. All other productions decreased, Fe ore almost 70% to 133,111 tons, Cu ore 7.5% to 456,909 tons, pyrite 61% to 29,500 tons. Nonmetallics showed less decline. AHE (16)

Gold and Silver as Money Metal. T. A. RICKARD. *Bulletin Institution of Mining & Metallurgy,* No. 328, Jan. 1932, pages 1-51; No. 329, Feb. 1932, pages 27-49; No. 330, Mar. 1932, pages 29-38; No. 331, Apr. 1932, pages 33-45. Discussion of paper abstracted in *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 309. AHE (16)

The Technical Organization Study of Sectional Working Periods in the Iron Industry. (Die organisationstechnische Untersuchung von büromässigen Arbeitsabläufen in der Eisenindustrie.) FRANZ PETZOLD. *Archiv für das Eisenhüttenwesen,* Vol. 6, Aug. 1932, pages 85-88. Report 59 of the Committee on Economy of Operation of Verein deutscher Eisenhüttenleute. The necessity is pointed out of a study of the jobs and preparation of the work in a commercial way, as well as a plan of the work on a purely technical basis. The most important method of the commercial preparation of work lies in an organization study of the work periods through the aid of the consecutive number plans. These consecutive number arrangements have been developed by the Reichskuratorium for Economy (RKW.) and the Gesellschaft for Organization (GfO.) In this method suggestions are made for ascertaining total time requirements and total costs of commercial jobs. DTR (16)

Canada's Gold Achievement Greatest Since the Rand. E. BALIOL SCOTT. *Mining Journal,* London, Vol. 178, Sept. 3, 1932, page 587. Canadian Au production in 1931 was worth $56,000,000. In 1932 it probably will be $65,000,000 and the forecast for 1933 is $73,000,000. AHE (16)

The Depression of 1931 and the Iron Market. (Der Krach von 1931 und der Eisenmarkt.) H. J. SCHNEIDER. *Die Metallbörse,* Vol. 20, Jan. 9, 1932, pages 33-34; Jan. 16, 1932, pages 65-66. Review of the economic situation in Germany with particular reference to the developments in the Fe-industry during the year 1931. The domestic market and the prospects of the Fe-export business are critically discussed. EF (16)

The German Metal. (Das deutsche Metall). *Oberflächentechnik,* Vol. 10, Jan. 3, 1933, page 5; *Aluminium,* Vol. 14, Dec. 31, 1932, pages 1-2. Development of Al industry in Germany which is at present largest producer in Europe is described. Al is made principally from bauxite of about 60% Al content, which is finely ground, mixed with soda and limestone, and converted by heating into water-soluble sodium aluminate. Calcinated mass is melted and decomposed by electric current. Great field of employment of Al in construction of airplanes, Zeppelins, in electrical industry, etc. is discussed. Total production in Germany in 1930 was 30,000 tons. Ha (16)

The Revival in the Copper Market. *South African Mining & Engineering Journal,* Vol. 43, Part II, Sept. 10, 1932, pages 7-8. Cost of Cu production, world Cu production and Northern Rhodesia's favorable position in the world picture are discussed. AHE (16)

The Non-Ferrous Metal Industry in the U.S.S.R. M. Zvegintzov. *Journal Institute of Metals,* Vol. 50, Nov. 1932, pages 137-140. Review of proposed development of production during the years 1931-1937 of Cu, Zn, Pb, Al and Ni in the Soviet Union, mineral resources and existing plants and those still to be built. Relation to economic situation is discussed; at present, running costs of exploitation are very high due to the enormous speed with which new constructions and plants are built. Ha (16)

Statistical Data on Steel Casting Production in the United States. G. P. Rogers. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 50-57. The production of steel castings in the United States from 1898 to 1930 is given by processes and by percentages of total outputs by processes. Data is also given on the production of alloy steel castings from 1910 to 1930 and net tons by industries for the year 1929. VVK (16)

Iron Ore, Pig Iron and Steel in 1931. H. W. Davis. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Dec. 15, 1932, pages 117-151. In 1931 production of Fe ore (31,131,502 tons) decreased 47% compared with 1930. It was 48% of the average for preceding 5 years and 53% of 10 year average. Output of pig Fe (17,952,613 tons) and ferro-alloys (466,969 tons) decreased 42% compared with 1930 and was 49% of 5 year and 54% of 10 year average, and required about 35% of capacity. It represented about 33% of world's production. Building used 18.5% of total steel (19% in 1930), automotive industry 16% (15.5% in 1930), and railroads 13.5% (15% in 1930). Bessemer steel production decreased 40% and open-hearth 36%. Of the total, 86.76% was open-hearth. AHE (16)

Present Day Problems of Commercial Industrial Operation (Gegenwartsfragen der kaufmännischen Betriebswirtschaft). H. Dinkelbach. *Stahl und Eisen,* Vol. 52, Nov. 24, 1932, pages 1144-1153. Report No. 64 of Committee on Operating Economy of Verein deutscher Eisenhüttenleute. Entire commercial organization of a large industrial enterprise is discussed with regard to its purchasing, selling and financing departments. Close connection with manufacturing plant is treated; examples are given of forms and chart systems to make an easy and quick accounting of all individual processes possible. The psychological influence of human factor must not be neglected. Ha (16)

Regular Cost Accounting in Forge Works on a Time Basis. (Selbstkostenberechnung in Schmiedebetrieben auf Zeitgrundlage.) Erich Czermak. *Stahl und Eisen,* Vol. 52, Sept. 8, 1932, pages 869-879. Report 609 of Committee on Plant Economy of Verein deutscher Eisenhüttenleute. A method is detailed for computing costs in forging plants. Key unit costs form the basis of the system. 2 examples cited illustrate details. Writer contends that this method of cost accounting may be employed similarly in any industrial works. DTR (16)

Unification of the Plant Power Stations with the Regional Network. J. L. Frankfurt. *Domez,* No. 3, 1932, pages 23-29. (In Russian). Possibility of unification of power stations of different metallurgical regions into an interconnected net work similar to those used in Lorraine is considered from an economic standpoint under Russian conditions. (16)

Gold, Silver, Copper, Lead and Zinc in Arizona in 1930. C. N. Gerry & T. H. Miller. *United States Bureau of Mines, Mineral Resources of the United States, 1930,* Part 1, Nov. 14, 1932, pages 1085-1142. In 1930, Ariz. produced Au, Ag, Cu, Pb and Zn valued at $81,042,416, a decrease of 48% from 1929. Cu represented more than 92% of the total. Au output was $3,501,610, 16% less than 1929 and the least since 1921. Ag production decreased more than 26% to 5,540,732 oz. worth $2,133,182, 47% less than 1929. Cu output was 576,190,607 lbs., a decrease of 31% and less than any yr. since 1922; the value fell almost 50% to $74,904,779. Pb decreased to the smallest amt. since 1921, 8,491,623 lbs. (16,054,122 lbs. in 1929), selling for $424,581 ($1,011,410 in 1929). Zn production dropped from 2,458,580 to 1,630,506 lbs., worth $78,264, $162,266 in 1929. AHE (16)

Arsenic, Bismuth, Selenium and Tellurium in 1931. C. N. Gerry & H. M. Meyer. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Oct. 20, 1932, pages 9-16. Production of As as As_2O_3 in the U. S. in 1931 was 17,137 short tons, 14,482 refined and 2,655 crude, all as a by-product from Cu and Pb smelting. Sales amounted to 13,777 tons, as compared with 17,425 tons in 1930 and 14,546 tons in 1929. Figures (by countries) for world production are given for 1930. Se output was 185,307 lbs., a decline of 59%. Sales of Se increased 5%. Bi and Te production was reported by only 2 companies each. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Oregon in 1930. V. C. Heikes. *United States Bureau of Mines, Mineral Resources of the United States, 1930,* Part 1, Nov. 4, 1932, pages 1029-1046. The value of the mine production of Au, Ag, Cu, Pb and Zn in Ore. was 33% less in 1930 than in 1929. The output of each metal except Zn decreased; Zn was produced for the first time. Au output was $297,702 ($55,621 decrease); Ag production was 9,000 oz. worth $3,465, 21,009 oz. and $12,530 less than 1929; Cu output was 176,300 lbs. valued at $22,919, decreases of 73% and 80%, respectively; Pb production was 9,113 lbs., a decrease of 55%, worth $456, a decline from $1,271. AHE (16)

Russia's High-Grade Iron Ore, Over 2¼ Billion Tons, Rivals United States'. R. C. Allen. *Steel,* Vol. 90, Apr. 18, 1932, pages 19-20, 40-42, 44. Summary of 2-year investigation by staff of 20 American mining engineers and geologists. Greatest of Russia's iron ore deposits are in South Russia near Black Sea. Krivoli Rog range has yielded over 100,000,000 tons (metric) and has an estimated reserve of over 1,025,000,000 tons of ore at a depth of less than 800 meters. This ore is high grade, surpassing Lake Superior ores. The ores of Kertch peninsula, although of low grade, are estimated at 4,200,000,000 tons of which 400-500 million is directly accessible. Iron ore reserves of Central Russia are estimated at from 50 to 150 million tons. Reserves of ore at Magnitogorsk in Ural Mountains are estimated at 200,000,000 tons on western slope; 65,000,000 tons on eastern slope; and 100,000,000 tons in surrounding territory. In Bakal district ore, although of low grade is estimated at 115,900,000 tons and in Tagil and Magedinsk districts at 115,000,000 tons. JN (16)

Gold, Silver, Copper, Lead and Zinc in California in 1930. V. C. Heikes. *United States Bureau of Mines, Mineral Resources of the United States, 1930,* Part 1, Nov. 4, 1932, pages 963-1027. Au, Ag, Cu, and Pb output in Calif. in 1930 was valued at $13,801,004, a decrease of 9% from 1929. Au increased 11% to $9,451,162, Ag increased 38% in quantity to 1,622,803 oz. and decreased less than 1% in value to $624,779. Cu decreased 18% in quantity to 27,285,272 lbs. and 39% in value to $3,547,085, Pb increased 149% in quantity and 98% in value, 3,559,564 lbs. worth $177,978. No Zn was produced. AHE (16)

The Economic Value of the Steel Industry to the United States. George H. Charls. *Preprint,* May 1932, *American Iron & Steel Institute,* 11 pages. Appraisal of value of steel industry to economic prosperity of United States. VVK (16)

Mine Production of Gold, Silver, Copper, Lead, and Zinc in Colorado in 1931, by Counties. Chas. W. Henderson. *U. S. Bureau of Mines, Mineral Market Reports* No. M.M.S. 156, Dec. 17, 1932, 2 pages. Au production in Colo. in 1931 was 233,299.75 oz. (218,539.82 oz. in 1930); Ag output was 2,195,914 oz., ½ that of 1930, worth $636,815, more than $1,000,000 less than 1930; Cu production was 8,165,000 lbs. (10,514,000 lbs. in 1930) worth $743,015 ($1,366,820 in 1930); Pb output of 13,768,000 lbs. compared unfavorably with 44,260,000 lbs. in 1930, worth $509,416 and $2,213,000, respectively; Zn production was 32,373,000 lbs. (72,518,000 lbs. in 1930) worth $1,230,174 ($3,480,864 in 1930); a total value of $7,942,154 in 1931 and $13,265,701 in 1930. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Colorado in 1930. Chas. W. Henderson. *United States Bureau of Mines, Mineral Resources of the United States, 1930,* Part 1, Nov. 8, 1932, pages 1047-1083. The value of Au, Ag, Cu, Pb and Zn recovered and estimated recoverable in Colo. in 1930 decreased 13% from 1929 to $13,265,701. The value of Au increased 2% to $4,517,619; Ag value decreased 28% to $1,687,398 with a decline of only 14,525 oz. to 4,382,852 oz.; Cu decreased 13% in value to $1,366,820, although increasing 1,608,926 lbs. to 10,514,000 lbs.; Pb value decreased 28% to $2,213,000 with a decrease of 4,629,906 lbs. to 44,260,000 lbs.; Zn value decreased 10% to $3,480,864 with an increase from 58,861,000 to 72,518,000 lbs. AHE (16)

Tungsten in 1931. F. L. Hess. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Oct. 20, 1932, pages 43-50. In 1931, shipment of tungsten concentrates was equivalent to 1,404 short tons, carrying 60% WO_3, valued at $928,000, as compared with 702 tons worth $509,000 in 1930. Of the 1404 tons, 1203 tons were scheelite and 201 tons of ferberite, huebnerite and wolframite. Most of the scheelite was from Nev. China exported 7,492 and Burma 4,918 tons of 60% concentrates. AHE (16)

Metal Refining Facilities of Canada. R. W. Brigstocke. *Canadian Mining & Metallurgical Bulletin,* No. 247, Nov. 1932, pages 641-686. Figures for world production and consumption (by continents, British Empire and N. American countries) annually for 1927 to 1930, Canadian production by companies, refineries in the British Empire and their capacity by companies are given for Cu, Pb, Zn and Ni. Similar but lesser data are given for Au, Ag, Co, Cd, Pt group, Cr, Al, Bi, Ti, U and Ra. Flow of Cu from each producing company through smelter, refining plant and sales agent is traced. Each metal is discussed. AHE (16)

Iron and Steel Manufacture in Larger Industrial Countries during 1913 and 1922-1931. (Järn- och staltillverkningen i de större industriländerna under aren 1913 och 1922-1931.) Arvid Johansson. *Jernkontorets Annaler,* Vol. 116, Sept. 1932, pages 438-446. Statistical summary. HCD (16)

Bauxite and Aluminum in 1931. C. E. Julihn. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Oct. 17, 1932, pages 17-41. In 1931 world production of Al declined 17%, but consumption declined still more. Production in the U. S. declined more than 22% to 177,544,000 lbs., valued at $37,284,000, a 27% decline. Imports decreased 39% in value to $3,210,745, and exports 60% to $2,854,745. The U. S. produced 35.67% of the world production, Canada 13.07, Germany 11.08, France 10.63, Norway 9.49, Switzerland 7.09 and all others 12.97%. 30,300 short tons of secondary Al were recovered. Bauxite production was 199,037 metric tons, worth $1,140,629, as compared with 335,918 tons worth $1,928,297 in 1930. AHE (16)

Mineral Resources of the United States, 1931, Summary. O. E. Kiessling, M. B. Clark & E. T. Shuey. United States Bureau of Mines, Oct. 31, 1932, 110 pages. The aggregate value of all mineral products in 1931 was $3,180,000,000, a decline of 33% from 1930 and 46% from 1929, to the lowest value since 1915. Except for Au and a few mineral products of minor importance $6,500,000) the downward trend was general. The total value of metallic products declined 42% from 1930. Striking declines of 44-54% were experienced by the important industrial metals, Cu, Fe, Pb, Ag and Zn. Au gained 4.8%. Relatively large gains in the production of tungsten ores and chromite were accompanied by much smaller gains in value. The output of Hg and Ni increased 16 and 23%, respectively, but the total values were less than in 1930. These 5, plus rutile and U and V ores, were the only products in the metal group to show value declines of less than 20%. AHE (16)

Gold in Africa. (Gold in Afrika.) E. Krenkel. *Die Naturwissenschaften,* Vol. 20, Sept. 9, 1932, pages 679-687. The early history of African Au and the present natural occurrences are dealt with in great detail. EF (16)

Metal Statistics for 1931. (Die Metallwirtschaft im Jahre 1931.) S. Kugelmann. *Internationale Bergwirtschaft und Bergtechnik,* Vol. 25, May 15, 1932, pages 65-66. Price range and world production of Cu, Sn, Pb, Zn during 1929-1931 is traced, share of principal producers of Sn, Zn and Pb during 1913, 1929-1931 and the surplus of these metals are given. EF (16)

The Aluminum Industry. (L'Industria dell'alluminio.) L. Manfredini. *Alluminio,* Vol. 1, July-Aug. 1932, pages 213-236. A review. AWC (16)

The International Mining Industry in the Economic Depression. (Die Weltmontanindustrie in der grossen Wirtschaftskrise.) M. Meisner. *Internationale Bergwirtschaft und Bergtechnik,* Vol. 25, July 15, 1932, pages 89-92. A wealth of data is compiled in 11 tables showing the world's production of coal, oil, Au, Ag, Fe, steel, Pb, Cu, Sn, Zn, Al and the production of the different countries in 1913, 1920, and 1925-1931. EF (16)

An Experiment in Organizing the Work in a Pipe Foundry. A. P. Osipov & Z. Schlemensohn. *Domez,* No. 9, 1932, pages 50-55. (In Russian.) A time study of a pipe casting installation. (16)

Mining Taxation in the Lake Superior District. Clarence B. Randall. *Preprint,* May 1932, *American Iron & Steel Institute,* 15 pages. Review of tax situation in Lake Superior ore district. Iron ore is taxed so excessively in Michigan and Minnesota that steel industry is forced to consider other resources including beneficiation of low grade ores. Dangers of a continuation of such excessive taxation to states involved is pointed out. VVK (16)

British World Empire on the Way to become Self Sustaining with Iron and Steel. (Das britische Weltreich auf dem Wege zur Selbstversorgung mit Eisen und Stahl.) J. W. Reichert. *Stahl und Eisen,* Vol. 52, Nov. 10, 1932, pages 1085-1094. Discusses former Fe and steel production in British Empire, need of additional importation, most important purveying countries of British Empire, chief products imported, new protective custom policy at home, England's former preference in overseas British possessions, England's acquisition of Ottawa, English decision on preferential policy of Ottawa, conjectural results of Ottawa policy. MGL (16)

Modern Problems of Industrial Plant Operating Economy. (Gegenwartsfragen der technischen Betriebswirtschaft). E. Rosdeck. *Stahl und Eisen,* Vol. 52, Nov. 24, 1932, pages 1133-1144. Paper No. 63 of committee for Plant Economy of Verein deutscher Eisenhüttenleute. Paper discusses development of views on plant economy before and after the war; fundamentals of organization are capital, machinery and men. Problems of plant economy must be reduced to proper use of material; proper analysis of operating conditions and proper recognition of human problems with regard to personnel, work rooms, time contract. Organization must take into account extraordinary conditions; for instance the dangers of over-organization are pointed out. Ha (16)

MACHINERY & SUPPLIES (18)

Flexibility of Shop Equipment is the Keynote of Metals Congress at Buffalo. JOSEPH GESCHELIN. *Automotive Industries,* Vol. 67, Oct. 15, 1932, pages 479-480. Discussion of various problems as brought out in S. A. E. Production Meeting, Buffalo, N. Y., Oct. 3, 1932. A list of 13 improvements in automotive tooling, equipment and methods that are being looked for by the designer are enumerated. Some of the topics considered were cemented carbide tooling, die casting practice, equipment policies, hydraulic presses, precision grinding. DTR (18)

Planning of Squirrel-Cage Motors for the Single Drive of Working Rolls. (Planung von Kurzschlussankermotoren für den Einzelantrieb von Arbeitsrollen.) WILHELM HELIAS. *Stahl und Eisen,* Vol. 52, Sept. 15, 1932, pages 901-904. Mathematical equations are derived, illustrated by examples, for computation of performance of squirrel-cage motors used for driving conveyor and working rolls. Factors taken into consideration include the number of hourly runs or brakings, sum of vibration moments, relative switching periods, speed and required running time. From calculated motor performance a method is demonstrated for correct choice of this class of motors for use in single-drive work. DTR (18)

Manufacture of Wire Products. (Aus Draht verarbeitenden Betrieben.) A. HERZ. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Nov. 27, 1932, pages 622-623. Author describes modern fully automatic wire bending machines for making small size wire products and special wire bending machines for standard articles. Details of constructions and operation of such machines are discussed at length. GN (18)

Bending and Hardening Machine for Spring Leaves. (Blattfeder- Biege- und Härtemaschinen.) HANS MAAS. *Glasers Annalen,* Vol. 112, Jan. 1, 1933, pages 3-5. Methods of rebuilding slackened spring leaves are discussed. They are to be straightened and hardened. Automatic bending and hardening machines of Collet & Engelhard Co., Offenbach, Germany, are described. GN (18)

Modern Ore Bridge. R. W. MONROE. *Electrical World,* Vol. 100, Sept. 17, 1932, pages 369-372. New ore bridge in Pittsburgh district is used for feeding 4 large blast furnaces in addition to stocking ore. Among the innovations of electrical equipment is the electro-pneumatic control. Advantages of this type of control are listed. Operating cycle is graphically shown. CBJ (18)

Circular Saws for Cutting Metals (Les Scies circulaires pour sciage des métaux à froid). M. J. LEYMARIE. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, May 1932, pages 172-181. Different types of saws for cutting cold metal are described. GTM (18)

Iron the Defiler. H. A. SCRIBNER. *Better Enameling,* Vol. 3, Jan. 1932, pages 4-7. Many applications of magnetic separators are discussed and classified into 3 heads: (1) removal of Fe for improvement of finished product, (2) protection of crushers and grinders, and (3) concentration of ores, etc. CBJ (18)

The Sense and Saving in Rebuilding Large Rotating Machinery. M. W. SMITH. *Electric Journal,* Vol. 29, Dec. 1932, pages 548-551, 554. Large rotating electrical machinery has been improved in efficiency and losses reduced with improvements of last decade. Many instances of drastic improvements are cited. Plant electrification in steel mills with specific examples are discussed. Twin-roll drive utilizing a motor on each roll of a mill and displacing the customary pinions and pinion housings is an example of recent progress. This type of drive increases production due to faster acceleration, noises and vibrations are absent in the rolling operation, pinion maintenance and delays are eliminated. Economies resulting from a change of process are effected; the Aston process for manufacturing wrought Fe is pointed out as an example. CBJ (18)

Electrically-Driven Roller Beds for Shears and Other Machines. (Elektrollen für Arbeits- und Scherenrollgänge.) MAX FISCHER. *Stahl und Eisen,* Vol. 51, Dec. 1931, pages 1951-1592. The author discusses the mechanical conditions to be taken into consideration in the design of electrically-driven roller beds. Equations are given for ascertaining differences in the torque for multiple and single drive of the rolls. DTR (18)

Heavy Duty Contactors for Mill Service. D. L. PIERCE. *Blast Furnace & Steel Plant,* Vol. 20, Aug. 1932, pages 648-651. Outlines trend in design of contactors. MS (18)

Combined Rolling and Riveting Machine. (Kombiniertes Roll- und Nietwerkzeug.) MAX THIELE. *Zeitschrift für wirtschaftliche Fertigung,* Aug. 1932, pages 93-94. Machine for shaping and riveting oval sheet cylinders described. GN (18)

High Speed Hydraulic Scrap Baling Press. (Schnell arbeitende Druckwasser-Schrottpaketierpresse.) *Demag Nachrichten,* Vol. 6, July 1932, pages C26-C27; *Demag News,* Vol. 6, July 1932, pages C26-C27. Description of equipment for making scrap bundles of great compactness. GN + Ha (18)

Forging Cranes and Turning Devices. (Schmiedekrane und Wendevorrichtungen.) *Demag Nachrichten,* Vol. 6, July 1932, pages C25-C26; *Demag News,* Vol. 6, July 1932, pages C25-C26. Brief description of a 115/30 and a 47/10 ton crane. The turning of the ingot can be accomplished by one crane instead of by 2 as usual. Ha + GN (18)

Increasing the Capacity of Lathes by Additional Apparatus. (Steigerung der Drehbankleistung durch Zusatzapparate.) O. LICH. *Die Werkzeugmaschine,* Vol. 36, June 30, 1932, pages 219-221. Description of special supports for turning lathes, tool holders, apparatus for increasing speed of millers, etc. GN (18)

The Recovery of Precious Metals from Factory Waste. JOHN S. ISDALE. *Brass World,* Vol. 28, July 1932, pages 138-139. A cyclone dust collector and a concrete settling tank, suitable for precious metals recovery, are described and illustrated. Methods of treating Ag and Au solutions are outlined. WHB (18)

Traveling Derricks Speed Erection of Structural Steel in New Terminal. *Steel,* Vol. 90, Feb. 15, 1932, page 30. Unusual speed in structural steel erection has been achieved in the construction of the Port Authority Inland Freight Terminal. New York, by the use of a system of traveling derricks mounted on rails to permit horizontal movement of lifting equipment at a given level. JN (18)

Development in Electrical Equipment for Steel Mills in 1931. HARRY A. WINNE. *Blast Furnace & Steel Plant,* Vol. 20, Jan. 1932, pages 71-74, 79. Deals particularly with the developments of the General Electric Co. Tabulates main roll driving motors supplied by the company during the year. Describes drives for a "push bench" to produce seamless steel tubes: 72" mill of the Otis Steel Co.: 76" mill of the Inland Steel Co.; 3-high universal plate mill of the Tennessee Coal, Iron & Railroad Co.; "automatic catchers" for sheet and tin-plate mills; electric regenerative drag; and a hot strip mill. Gives details of an automatic screw-down control apparatus for use on reversing blooming-mills, plate-mills and similar mills, which permits the roller to set up a complete schedule of passes on a master control board. He simply presses a button, or advances a master switch one notch, after each pass, and the top roll quickly and automatically is moved to a position corresponding to the set-up on the master board. The apparatus incorporates Selsyn instruments and Thyraton tube relays. Mentions several installations of Thyraton tube control for various purposes. MS (18)

Improvements in Iron and Steel Plant and Practice. *Metallurgia,* Vol. 6, July 1932, pages 75-80, 84. Describes recent construction at plant of John Lysaght Ltd. A low-grade ore is used and all heat is supplied by blast-furnace and coke-oven gas. JLG (18)

Electrohydraulic Operator Has Many Applications. *Steel,* Vol. 90, Feb. 22, 1932, page 26. The Electrohydraulic Operator, manufactured by the General Electric Co., Schenectady, N. Y., consists essentially of a piston actuated by oil pressure. The oil pressure is supplied by a small pump driven by an electric motor. This machine can be connected to heavy shop equipment to produce smooth and uniform starting and stopping action. It has found numerous applications in the metal working industries. JN (18)

MISCELLANEOUS (20)

A few Remarks on the Construction of Castings. (Einiges über die Konstruktion von Gussstücken.) KARL GROCHOLL. *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Dec. 10, 1932, page 150. Stresses coöperation of builder and foundryman in properly designing castings. Appearance of stresses due to unreasonable dimensions of wall thicknesses is pointed out in particular. GN (20)

The Calculation of Cylindrical Helical Springs. (Die Berechnung zylindrischer Schraubenfedern.) O. GOEHNER. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Mar. 12, 1932, pages 269-272. Theory and development of practical formulas for different sections of springs. Ha (20)

A Study of the Catalytic Properties of Bright Platinum and Iridium Deposits in the Activation of Hydrogen. LOUIS P. HAMMETT & ARTHUR E. LORCH. *Journal American Chemical Society,* Vol. 55, Jan. 1933, pages 70-80. Methods have been perfected for the preparation by electrodeposition of Pt and Ir catalysts of reproducible properties for the activation of H. MEH (20)

The Recovery of Noble Metals in Scrap. (Ueber die Aufarbeitung edelmetallhaltiger Abfälle.) W. STEIN. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle,* Vol. 6, May/June 1932, pages 19-25; July 1932, pages 35-40. Methods of recovering from waste material and scrap Au, Ag, Pt and Pd in jewelry industry are described and classified according to whether they are pure or impure alloys, filings, residues of electrolytic baths, grinding dust and sweepings, or waste water. Ha (20)

Manufacturing Economy Demands Huddle of Engineer, Tool Specialist and Factory Head Before Design Is Completed. ALEX TAUB. *Automotive Industries,* Vol. 67, Oct. 15, 1932, pages 475-476. Paper read at S. A. E. Production Meeting, Oct. 3, 1932, Buffalo, N. Y. Modern ideas in production are apparently a voluntary decrease in variations and improved mobility to change. Engineer expects production men to voluntarily reduce variations in castings and other structural units, bearing areas, weight of crank rods and pistons, crankshaft, crankpin index and radius, etc. At same time engineer hopes manufacturing men will buy machine tools designed with facility to change to meet ever progressing engineering practice. DTR (20)

Polarization of an Electron Beam by Crystal Reflection (Recherches sur la polarisation d'un faisceau d'électrons par réflexion cristalline). J. THIBAUD, J. J. TRILLAT & TH. v. HIRSCH. *Comptes Rendus,* Vol. 194, Apr. 11, 1932, pages 1223-1225. Certain theoretical considerations lead one to expect possibility of polarization of a reflected electron beam. Expected results are small, but experiments indicate no polarization. OWE (20)

Action of Copper in Glass Tanks. (Wirkung des in die Häfen gelangenden Kupfers.) M. A. BESBORODOW & M. F. SUHR. *Glasshütte,* Vol. 61, Feb. 9, 1931, pages 90-91. Tests are described in which pieces of Cu were deposited in a glass tank to ascertain the effect of Cu on the glass and the walls of the tank. No effect, or only a slight one, was noticed on the walls of the tank; it melted and was partly dissolved in the glass. The glass mass in contact with or near the Cu was colored ruby red by the action of the dissolved CuO_2. This color became paler and changed into pink and green farther away from the Cu. Ha (20)

Mechanical Deformation by Electric Discharges. (Mechanische Verformungen durch elektrische Entladungen.) O. BETHGE. *Annalen der Physik,* Series 5, Vol. 8, No. 4, 1931, pages 475-499. The mechanical deformation as occasioned by lightning in a lightning rod, is studied by the analogous phenomenon of the wavy deformation of a thin wire at sudden electric heating. A tentative theory explaining the phenomenon is developed. Ha (20)

Flow Potentials or Gliding Planes? (Fliesspotentiale oder Gleitebenen?) A. REUSS. *Zeitschrift für angewandte Mathematik und Mechanik,* Vol. 12, Feb. 1932, pages 15-24. The writer mathematically discusses the 3 main theories on flow: (1) the flow potential theory based on Mises condition of flow; (2) the flow potential theory based on Mohr's condition of flow; (3) the gliding plane theory including Mohr's condition of flow. The author reveals a means of checking the 3 theories by determining the change in volume of deforming tubular bodies and derives the underlying mathematical formula, which, in graphical representation, shows entirely different courses, thus challenging experimental decision. EF (20)

The Effect of Silica on the Dissociation of Iron Oxide. (Der Einfluss von Kiesel-Säure auf die Dissociation von Eisenoxyd.) J. KLEFFNER & E. J. KOHLMEYER. *Metall und Erz,* Vol. 29, May 1932, pages 189-194. Fe_2O_3 and SiO_2 were heated in a tubular Heraeus furnace in an atmosphere of N_2 to 800° to 1585° C. Fe_2O_3 dissociates according to the formula $3\ Fe_2O_3 = 2\ Fe_3O_4 + \frac{1}{2}\ O_2$. The presence of SiO_2 has no effect on the reaction. After Fe_3O_4 is formed some of it is decomposed with the formation of silicates, but some remains as such. The melting point of Fe_3O_4 in N_2 is 1580° C. 32 references. CEM (20)

Initial Stresses in Water Tubes. (Vorspannungen in Wasserrohren.) A. KONEJUNG. *Zeitschrift des Bayerischen Revisionsvereins,* Vol. 36, Feb. 29, 1932, pages 29-30. In devising formulas for calculating the wall thickness of boiler tubes the knowledge is utilized that the heat stresses set up are more or less equalized by small permanent deformations. The author has shown in a former paper (*Die Wärme,* Vol. 53, 1930, page 895) that such an equalization of the stress during operation must be apparent in initial stresses in the tubes in cold state. Experiments show that such initial stresses of from 4400 to 7100 lbs./in.^{2} exist in the circumferential direction of the tubes. These initial stresses counteract the heat stresses. GN (20)

The Generation of Steam from Blast-Furnace Gas. A. F. WEBBER. *Iron & Steel Institute, Advance Copy* No. 12, Sept. 1932, 37 pages; *Engineering,* Vol. 134, Nov. 11, 1932, pages 577-579. The importance of boiler efficiency as a factor affecting the heat balance of the plant is shown by examples from practice. The boiler efficiency obtained in industrial plants compares favorably with that obtained at power-station boiler houses. High thermal efficiencies are possible with boilers operated with blast-furnace gas. The blast-furnace gas should be burned with preheated air, and the gas should be heated if it has been scrubbed. Economies that may be effected by installation of modern boilers are calculated. 12 references.

Some Mill Products under the Microscope—A Contribution to Determinative Mineralogy. H. E. T. HAULTAIN & W. E. JOHNSTON. *Canadian Mining & Metallurgical Bulletin* No. 243, July 1932, pages 353-355. Several mineral powders heated on glass slides to dull red heat in a Bunsen burner gave characteristic colors. Tellurides melt into clear lakes with or without central globules of Au or Ag depending on their composition. If the plate is reheated with the flame playing directly on the lakes, various colors are produced. Bronze lakes are probably from Hg telluride and grays from Pb and Bi tellurides. Heated pyrite gives beautiful red particles; chalcopyrite turns red and gray, which becomes all gray in the direct flame. AHE (20)

Utilization of the Radioactive Occurrences in Industry. (Verwertungen der radioaktiven Erscheinungen in der Technik.) H. W. FLEMMING. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, May 29, 1932, pages 288-290. Abstract of the following papers before the 37th annual meeting of the Bunsen-Gesellschaft, May 16-19 at Münster. K. Philipp: Investigation of the natural H-rays; O. Hahn: Radioactivity and chemical elementary processes; L. Imre: Occurrences on limiting surfaces at the formation of crystals with continuous and non-continuous distribution of a microscopic component; G. Tammann: The behavior of polonium and thorium B to other metals; G. von Hevesy: The application of radiochemical methods; O. Erbacher: Investigations of kinetic occurrences on metallic surfaces; F. Strassmann; Barium-Radium salts of high emanation power. GN (20)

Aluminium in Foodstuffs. *Chemical Trade Journal & Chemical Engineer,* Vol. 90, June 10, 1932, page 565. A résumé of 3 papers presented before the Society of Public Analysts in London, June 1, 1932. Cooking in Al utensils increases the Al content of foods only a few parts per million. This amounts to 0.1 grain in a person's daily diet. When Al compounds are taken by mouth, only traces are absorbed. It is concluded that dangers from Al in foods are non-existent. JN (20).

Means for Protection from Heat of the Workers at Electric Furnaces. (Moyens à employer pour preserver les ouvriers de la chaleur dans la conduite des fours électriques). *Journal du Four Electrique,* Vol. 41, Nov. 1932, pages 418-419. Sketch showing that of rigid bars, wire netting and chain screens latter is more convenient to use being as efficient in heat removal as the rest. JDG (20)

Electric Resistance of Titanium and Zirconium Nitride and a New Resistance Effect (Ueber den elektrischen Widerstand des Titan-und Zirkonnitrides und einen neuen Widerstandseffekt). P. CLAUSING. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 208, Nov. 1932, pages 401-419. TiN and ZrN was obtained by distintegration of a gas mixture on a glowing metal (Ti or Zr) wire; deposit of a solid reaction product on wire was a nitride with a greater electric conductivity than corresponding pure metals possessed; they were about 0.5 x 10^{-4} ohms/cm. and smaller. A hysteresis effect was discovered in both wires obtained in this manner which seems to be due to free metal in the nitride. Ha (20)

Leipzig Spring Fair 1932. (Die Leipziger Frühjahrsmesse 1932.) E. ASTER. *Feuerungstechnik,* Vol. 20, Apr. 15, 1932, pages 56-60. Describes salient features of laboratory and industrial furnaces exhibited. A few advances may be mentioned: Siebert-Hanau raised the furnace temperature up to 1600° C. by the use of Rh resistance coils. Deutsche Gold- und Silber-Scheideanstalt-Frankfurt utilizes the surface combustion and attains 2000° C. (MgO or ZrO crucibles). Among the pyrometers those of the Pyro Werke Hannover are outstanding covering the temperature range of 500°-2000° C. Siebert increased the thermo-power of the conventional Pt-Pt/Rh thermo-couples 3-4 times by using Pt-Pt/Rh/Re and Pd-Pt/Rh/Re as metals. The new pyrometers are even cheaper. Maximum temperature = 1600° C. EF (20)

Peculiar Vibration Condition of a Leaf Spring. (Ein eigenartiger Schwingungszustand einer Blattfeder.) J. JAUMANN. *Zeitschrift für Physik,* Vol. 79, Nov. 14, 1932, pages 235-247. Leaf or plate spring clamped on one side can be put by an impulse in direction of plane of leaf or plate, in an oscillating condition in apparent contradiction to law of conservation of impulse. This is elucidated by Prandtl's theory. Application as frequency meter or tachometer is suggested. Ha (20)

Thermal Conductivity in Tubes with Reference to Unequal Heat Distribution. (Wärmeleitung im Rohr bei ungleichmässiger Wärmebelastung.) A. KONEJUNG. *Zeitschrift für angewandte Mathematik und Mechanik,* Vol. 12, Aug. 1932, pages 229-233. In order to study thermal stresses occurring in boiler tubes, knowledge of stationary temperature field is pre-requisite. Writer calculates temperature distribution in case of irregular thermal exposure. EF (20)

Gas Protection at Coking and Steel Plants in the Rhenish-Westphalian Industry Center. (Gasschutz auf Kokereien und Hüttenwerken des Rheinisch-Westfälischen Industriegebietes.) LAMPRECHT. *Zeitschrift für das gesamte Schiess- und Sprengstoffwesen,* Vol. 27, Apr. 1932, pages 139-142. Describes safety means against gas poisoning and shows for what particular work gas masks are used in the coking and steel mills of the Ruhr District. EF (20)

Industry in War. CHAS. T. MCALEER. *Wire & Wire Products,* Vol. 8, Feb. 1933, pages 43-50, 58. Author develops his ideas on close relations which industry must have to government in times of emergency. Surveys of industry, facilities, requirements must be available at all times so that coördination in effort without delay of time for production required is safeguarded in time of war. Ha (20)

Osmiridium in Tasmania. HAROLD S. ELFORD. *Engineering & Mining Journal,* Vol. 133, Nov. 1932, pages 580-581. Average analysis of samples of osmiridium from widely scattered alluvial workings in Tasmania showed: Os 45.5%, Ir 41.7%, Ru 6.4%, Pt 1.1%, and Rh 0.3%. Operation is not profitable in most cases at the present prices for the constituent metals. WHB (20)

Rationalisation of Manual Labour by Industrial Physiology. RENE LEONHARDT. *Foundry Trade Journal,* Vol. 47, Aug. 18, 1932, pages 97-98. The author points out that in experiments which have been performed to date on the expenditure of energy during work the object in view has generally been an increase in output by elimination of inefficient movements. Recent experiments on the consumption of energy in molding show that the better performance obtained by the elimination of inefficient movements is frequently accompanied by increased body fatigue. A comparison is made between 3 processes for the production of molds, in which measurements were made of the O taken in by the worker and of the CO_2 given off by him. A discussion of the results obtained is given. OWE (20)

Sleepers of Reinforced Concrete. (Gleisschwellen aus Eisenbeton.) G. REIN *Zement,* Vol. 21, Aug. 4, 1932, pages 451-452. The replacement of wood and steel railroad sleepers by reinforced concrete is critically discussed and urged. EF (20)

Proof for Magnetic Moment of Free Electrons by Reflection Measurements. (Nachweis des magnetischen Momentes freier Elektronen durch Reflexionsversuche.) E. RUPP. *Forschungen und Fortschritte,* Vol. 8, Oct. 1, 1932, page 356. Paper before Kaiser Wilhelm Institut für Medizin, Heidelberg, July 1932. Reflection of electron pencils of 380 volts on 2 Cu single crystals and polarisation of high-speed electrons by Au and Al-wire. EF (20)

Plan of Study for the Science of Metals (including Physical Chemistry of Metallurgical Reactions) in Breslau. (Aus den Hochschulen. Studienplan für Metallkunde (einschl. allgem. phys.-chem. Metallurgie) in Breslau.) F. SAUERWALD. *Zeitschrift für Metallkunde,* Vol. 24, Sept. 1932, page 239. A list of courses with credit hours and names of instructors given in last 4 semesters (last 2 years) in the Technische Hochschule at Breslau to candidates in a new curriculum in science of metals (*Metallkunde*). RFM (20)

Some Recently Discovered Phenomena at Contact Plane of Differently Conducting Materials. (Über einige neuentdeckte Effeckte an der Berührungsstelle verschieden leitender Stoffe.) W. SCHOTTKY. *Forschungen und Fortschritte,* Vol. 8, Aug. 1, 1932, pages 281-282. Mainly deals with the barrier layer effect. It has not yet been proved definitely whether 2 metals separated by a thin poorly conducting film display a dissymmetry or at least a dependence of voltage on their transition resistance. EF (20)

Researches on Ferrosilicon. W. SCHUT & J. D. JANSEN. *Recueil des Travaux Chimiques des Pays-Bas,* Vol. 51, Mar. 15, 1932, pages 321-341. Fe-Si containing more than 5% is made in electric furnace by fusing SiO_2, Fe and C. Production, excluding America, was about 150,000 tons in 1931. Compounds Fe_3Si_2, FeSi and $FeSi_2$ are known. Because of impurities, Fe-Si in contact with H_2O evolves PH_3 and AsH_3. Evolution of PH_3 is due to Al and P, not to Ca and P. PH_3 and sometimes AsH_3 have been noted only with samples containing more than 25% Si. For alloys containing Al and Mn this limit does not apply. Alloys containing 40-60% Si disintegrate spontaneously. No explanation for this has been given. Because of greater surface after disintegration, PH_3 emanation is much greater with Fe-Si containing 40-60% Si. In determination of PH_3 by absorption in $AgNO_3$ the factor $PH_3 = 6AgNO_3$ is used. To determine small quantities of P the Lorenz method is used. Sp. gr. determination and darkening of photographic plates by X-rays will determine Si to an accuracy of 3%. In Si determination account must be taken of fact that products of Si content of 80% are separable by sieves into powders with great difference in sp. gr. and consequently Si content. Ha (20)

FOUNDRY PRACTICE & APPLIANCES (22)

The Control of Hardness and Other Mold Properties. H. W. DIETERT. *Transactions & Bulletin American Foundrymen's Association,* Vol. 3, May-June 1932, pages 63-71. An arbitrary definition of mold hardness is the deformation in thousands of an inch of the mold surface when supporting a load of 237 g. on a circle 0.2" in diameter. Properties of molds as affected by clay bond and sand grain sizes shown. CHL (22)

High Capacity Jolting Molding Machine with Roll-over and Pattern Drawing Device. (Hochleistungs- Rüttelformmaschine mit Umroll- und Absenkvorrichtung.) M. SCHIED. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 370-371. Description of the jolt-ramming machine, system Hartung-Herman, of the Hartung Co., Berlin-Lichtenberg which is distinguished by simple attendance. All stages of operation, as jolting, roll-over and pattern drawing are actuated by one lever. GN (22)

Pattern and Mold for a Check-Valve. (Modell und Form zu einem Absperrventil.) RICHARD LÖWER. *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Sept. 10, 1932, pages 111-112. Description of a method to make pattern, mold and core of check-valves efficiently. GN (22)

Molding Non-Ferrous Castings for Household Machines. EDWIN BREMER. *Foundry,* Vol. 60, Jan. 15, 1932, pages 14-18. Describes foundry work of Apex Electric Manufacturing Co., Cleveland, makers of washing machines, vacuum cleaners, electric ironers, electric refrigerators and exercising machines. Al, gray Fe, brass, bronze and Zn base castings are used in constructing the various machines. VSP (22)

Core Making Past and Present. (Die Kernmacherei Einst und Jetzt.) H. BREITENSTEIN. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 4, 1932, pages 352-353. After briefly discussing the methods of core making some 25 years ago, the advantages derived from the use of quartz sand and oil cores are considered. Large oil cores are made according to the "freezing method." 1½-2% of a specially prepared oil is added to the dry warm quartz sand which is filled in the core-box without being rammed. The time saving derived from this type of core making is considerable. The coarser, purer and warmer the quartz sand for freezing cores, the lower the amount of oil required and the more rapid the "freezing." Sticking of the sand mixtures in the box can be avoided by the use of non-lacquered boxes, or coating lacquered boxes with graphite. GN (22)

Turning Plates with Openings. (Wendeplatte mit Aussparung.) G. LINKE. *Giesserei,* Vol. 19, Mar. 18, 1932, pages 106-108. A method for molding castings of thin wall thicknesses is described consisting of a core box connected to a plate with opening which is first used for the lower part of the mold and after turning 180° for the upper part. This method is said to be economical in cases where many pieces have to be made by manual molding. A few examples illustrate the process. Ha (22)

Modern Machines, Tools and Materials for Pattern Making. (Neuzeitliche Maschinen, Werkzeuge und Materialien für den Modellbau.) ARNO. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 385-388. The author describes modern turning lathes for wood, core box milling machines, motor-driven hand saws, precision guides for endless saws, precision calipers (accurate readings up to 1/100 mm.), adjustable hollow planes, etc. GN (22)

Multiplications of Wooden Patterns in Gypsum. (Vervielfältigungen von Holzmodellen in Gips.) FERD. BROBECK. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, pages 335-336. The paper discusses the various methods of reproducing in gypsum wooden patterns that are to be used frequently. GN (22)

Steel Castings. A Broad and General Survey of Some of the Factors Involved in the Production of Steel Castings. PERCY LONGMUIR. *Iron & Steel Industry & British Foundryman,* Vol. 5, June 1932, pages 325-327; July 1932, pages 359-360. Discussion of melting methods and processes of molding. CHL (22)

Accurate Template Molding. (Achte auf einwandfrei arbeitende Schablonier-Vorrichtungen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, July 24, 1932, pages 284-287. The paper discusses the various reasons that may cause inaccuracies in molding with templates. GN (22)

Machine Tool Castings. (Aus der Praxis des Werkzeugmaschinengusses.) MAX AHNER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, pages 323-324. Giving few examples of the practice of machine tool castings, the author discusses the proper arrangements of gates and risers in order to obtain sound castings. GN (22)

Influence of the Design of Castings on Their Manufacturing Costs. (Einfluss der Konstruktion von Gusstücken auf den Herstellungspreis.) LÖWER. *Machinenbau,* Vol. 11, Apr. 21, 1932, pages 166-168. Discusses the cost of 5 different ways of manufacturing a certain pattern and considers cases when it pays to use the more expensive pattern. RFV (22)

The Practical Application of the E-K-Briquettes. (Die praktische Verwendung der E-K-Pakete.) E. SCHÜTZ. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 21, 1932, pages 328-330. The E-K briquettes are used when foundries that generally make the same type of cast Fe are to melt special cast irons. 4 types of such briquettes are on the market: Si, Mn, P and Cr briquettes. Any composition of cast Fe can thus be obtained without difficulties. Examples show how they are used. GN (22)

Improvements in the Melting Practice of the Iron Foundry. (Neuerungen im Schmelzbetrieb der Eisengiesserei.) H. KALPERS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 371-373. The paper describes improvements in iron founding introduced during the past year. The rotating furnace used as forehearth to the cupola, introduced by the Badische Maschinenfabrik, Durlach, combines the advantages of such type furnaces with the low melting costs of the cupola. Slag skimming in cupola operation is facilitated by the described slag collector, system Schinke, Goslar. Another remarkable improvement is the cupola with rigidly attached forehearth and slag separator of the Badische Maschinenfabrik. Proper amount of blast and most favorable direction of blast which are both of extreme importance for attaining high temperatures at low coke consumption are achieved by the new devices of the Schinke Co. A method for improvement of cupola operation by water injection has been introduced by the Vulkan-Feuerung Co., Köln. The improved rotating furnace of Gewerkschaft Eisenhütte Westfalia, Lünen, is also described. GN (22)

Modern Molding Machines for Mass Production. (Moderne Formmaschinen für die Herstellung von Massenartikeln.) M. SCHIED. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Sept. 11/18, 1932, pages 364-367. Detailed and illustrated description of new types of German molding machines for the above mentioned purpose. Double squeezing-compressed air molding machines of the Badische Maschinenfabrik, Durlach, are described. They offer a great advantage in that the 2 halves of the mold are made in one operation, thus effecting a saving of time and sand. Special flasks have been designed for the method. Jolting machines of the same company are described. Similar machines of the Dietel & Keweloh Co., Düsseldorf, and the molding machine without flasks of the Universal Werkzeugmaschinen- und Apparatebau Co., Köln, are also described. GN (22)

Practical Silver Art Casting. (Praktischer Silberkunstguss.) *Deutsche Goldschmiedezeitung,* Vol. 35, July 2, 1932, pages 276-277. The paper deals with sand molding, the wax melting method, centrifugal casting. GN (22)

The Production of German Silver Art Castings. (Die Herstellung von Neusilberkunstguss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Aug. 7, 1932, pages 313-314. The frequently observed porosity of "German Silver" castings is chiefly due to the Ni which occludes gases to a large extent. To obtain sound castings purity of the constituents is of greatest importance and the alloy is first better cast in pigs and remelted to be cast in the mold. The melting procedure is discussed at length. GN (22)

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FURNACES & FUELS (23)

Electrical Bright Annealing of Copper. (Elektrisches Blankglühen von Kupfer.) E. FR. RUSS. *Zeitschrift für Metallkunde,* Vol. 24, Aug. 1932, pages 188-191. A discussion of furnace construction and atmospheric control, with data on physical properties and photomicrographs of bright annealed sheets. RFM (23)

Recent Developments in Electric Heat Treating Equipment. H. M. WEBBER. *Fuels & Furnaces,* Vol. 9, Dec. 1931, pages 1393-1398. Bright annealing of steel or of non-ferrous alloys is done in bell type furnaces provided with movable bases and internal hoods so that the charge can be removed for cooling without losing the reducing atmosphere. Cooling is accelerated by circulating the gas in a closed cycle through the hood and an external cooling system. Cu brazing in similar furnaces is done by assembling the steel articles, placing Cu wire or chips near the joints, and heating in the reducing gas until the Cu flows into the joints. Steel tubing is made by bending steel strip continuously into a 2-layered tube wall and brazing the layers together while passing through an electric tube furnace. The bell type furnaces consume about 175 kw. hrs./ton of steel annealed. For heat treating in air one plant is equipped with a double chamber roller hearth furnace, 2 pit type furnaces and a twin-chamber car bottom furnace, and will normalize, anneal, quench and temper steel bar from ⅜" to 8" in section and up to 25 ft. long. An air-draw furnace is provided with a high pressure fan which circulates air down over the heating units and up through the work, and is regulated automatically by a thermocouple between the heating units and the work. CMB (23)

A Large Installation of 33 Blank Annealing Furnaces. (Eine Grossanlage von 33 Blankglühöfen.) TH. STASSINET. *Elektrowärme,* Vol. 2, Feb. 1932, pages 36-40. On the basis of tests which extended over 2 years, an electrically heated blank annealing furnace was developed for the annealing of strip Fe on reels in an atmosphere of H. The heating elements consist of a 29% Ni steel which behaves well in H. The battery of 33 furnaces is divided into 11 groups each with 3 furnaces on one switchboard fed by 220 volts. Installation and temperature control are described. One furnace can be charged with 4000 kg. The monthly output of a furnace is about 50 tons. The use of H made special annealing boxes superfluous, the strip can be charged directly into furnace. The power factor is as high as 0.98, since it is pure resistance heating. The energy consumption is about 170 kwh./ton. Ha (23)

Dimensions, Load, Control and Consumption of Electrodes of Electric Arc Furnaces for Melting of Gray Iron and Steel. (Ausmasse, Belastung, Reglung und Verbrauch der Elektroden der Lichtbogenöfen zum Schmelzen von Grauguss und Stahl.) E. KOTHNY. *Elektrowärme,* Vol. 2, Feb. 1932, pages 44-47. Abstract from a report of the Committee of the Verein deutscher Giessereifachleute. Information has been obtained from the operators of electrical furnaces in several countries of Europe in order to define the consumption of electrodes and their arrangement and control. Ha (23)

An Electric Furnace of 12,500 KVA. (Un four électrique de 12,500 KVA en France). B. LACAZE. *Revue Industrielle,* Vol. 62, Jan. 1932, pages 19-25. This arc furnace installed at the "Compagnie d'Electricité Industrielle" has the largest power capacity in France. It is used for CaC_2 production. Mechanical charging devices, furnace and electrical apparatus and handling of carbide produced are described. FR (23)

Explanation for the Burning-out of Metallic Heating Resistances. (Erklärung für das Durchbrennen metallischer Heizwiderstände.) KIRCHRATH. *Elektrowärme,* Vol. 2, Feb. 1932, pages 47-48. It has been found that a chemical reaction between a metallic and a non-metallic substance can take place with weakening of the metallic part. If this is a heating element in a furnace, the weakening of the section tends to heat this weak spot still more until it burns through. Proper arrangement, especially suspension of heating elements, can eliminate trouble. Ha (23)

Large Resistance Furnaces. *Electrical Review,* Vol. 110, March 11, 1932, page 386. 3 Wild-Barfield furnaces are installed at the Banbury works of the Northern Aluminum Co.; 2 having chambers 14 ft. in length, 7 ft. in width, and 5 ft. in height to spring of arch, are among the largest installed in England. Ni-Cr heating elements are used. MS (23)

Resistance Vacuum Furnace. A. J. MADDOCK & H. CHENEY. *Engineer,* Vol. 153, Apr. 8, 1932, page 403. The furnace described is used for degassing small metal parts. It is a horizontal furnace, the loading and unloading of the boats carrying the metal parts is speedy and no elaborate vacuum seals are required. The winding is easily accessible and a wide range of temperature is available up to a maximum of 1400° C. Furnace made almost entirely of mild steel. LFM (23)

High-Frequency Furnaces. (Hochfrequenzöfen.) E. FR. RUSS. *Die Giesserei,* Vol. 19, July 8, 1932, pages 270-273; July 22, 1932, pages 284-288; Aug. 5, 1932, pages 309-312. The whole field of high-frequency furnaces without Fe core is reviewed and the development up to the present is described. The construction details, operation and capacities of the furnaces of the Societe Schneider & Cie., Debuch-Lorenz, Strutt, Technical University Charlottenburg, Ribaud, Ajax-Northrup, Lorenz, Siemens and Halske are described and some high-frequency generator details are given. The principal advantages of this type of furnace lie in its great cleanliness, natural stirring of the melt, no necessity of continuous operation, and higher temperatures obtainable, while the strong attack of the hearth, due to the movement of the bath, and consequently the great wear, must be counted as a disadvantage. Only certain materials can be used for the crucible or hearths and great depths are not economical. High-frequency generators and condensers are rather sensitive apparatus. The costs of operation are still fairly high. Ha (23)

Fuel Economy in German Coke Plants. KURT BAUM. *Proceedings 3rd International Conference on Bituminous Coal,* Vol. 1, 1932, pages 507-539. The effect of different variables in regenerative and non-regenerative coke ovens are shown graphically and discussed. AHE (23)

The Mechanism of Combustion of Solid Fuel. S. P. BURKE & T. E. W. SCHUMANN. *Proceedings 3rd International Conference on Bituminous Coal,* Vol. 2, 1932, pages 485-509. A detailed theoretical picture is presented of the mechanism of the combustion of solid C. The mathematical development of this theory is given. The results are in reasonably good agreement with available experimental data. The interrelation between the variables affecting the combustion of C predicated by the theory is essentially the same as that found by experiment. AHE (23)

An Experimental Study of the Burning Characteristics of Pulverized Fuels. RALPH A. SHERMAN. *Proceedings 3rd International Conference on Bituminous Coal,* Vol. 2, 1932, pages 510-551. The primary product that appears in the combustion of fuel in pulverized form is CO_2. With ratios of air to coal equal or greater than required, CO appeared only in small amounts in the initial carbonization of the coal. CO found in industrial furnaces is formed in the stream of coal and primary air and persists because of slow mixing with secondary air. No one numerical value was found that fully expressed the fineness of pulverized fuel with significance in regard to its combustion. The specific surface did not have greater significance than the amount passing 200-mesh. For equal amounts passing 200-mesh, the amount retained on 100-mesh was markedly significant. The rates of combustion and percentages of unburned C varied greatly with the type of fuel. Semi-cokes with as low as 12.8% volatile matter burned satisfactorily although their C loss was higher for similar conditions than that of coal from which made. AHE (23)

REFRACTORIES & FURNACE MATERIALS (24)

On Elastic Torsion and Plastic Deformation of Refractory Bricks at Elevated Temperatures. (Ueber elastische Verdrehung und plastische Verformung feuerfester Stoffe bei höheren Temperaturen.) KURD ENDELL & W. MÜLLENSIEFEN. *Berichte der deutschen keramischen Gesellschaft,* Vol. 13, Aug. 1932, page 371. Abstract of paper before 13th annual meeting of Deutsche Keramische Gesellschaft, Sept. 25-27, 1932, Berlin. Relations between elastic distortion and stability against thermal shock of fire clay bricks and highly refractory special bricks were investigated. Behavior of same refractory bricks under variable torsional stresses was studied up to 1400° C. in "Atom" torsion apparatus according to W. Steger. Softening of refractories under torsion and pressure respectively is compared. Conclusions are drawn on the manufacturing processes of refractories (shaping, grain size, grain distribution) and behavior under service conditions. GN (24)

Chromite- Silica Bricks. (Chromit- Silika Steine.) P. P. BUDNIKOFF & E. L. MANDELGRÜN. *Berichte der deutschen keramischen Gesellschaft,* Vol. 13, Nov. 1932, pages 521-524. Whereas chromite bricks are not very stable against deformation under loads at high temperature but, on the other hand, are highly resistant to the effect of alkaline and acid slags; silica is not very stable thermically but softens only at high temperatures and possesses a high softening temperature under pressure. It is shown that refractory bricks combining these 2 materials are most stable against the attack of all kinds of slags, are thermally stable and have a sufficiently high temperature of beginning deformation under load. The quality of such bricks depends on the amount of Fe oxides present; it should be as low as possible. GN (24)

Destruction of Blast Furnace Shaft Bricks. (Zerstörungserscheinungen an Hochofenschachtsteinen.) FRITZ HARTMANN. *Stahl und Eisen,* Vol. 52, Nov. 3, 1932, pages 1061-1066. 8 different kinds of destruction of refractory bricks were differentiated. Their frequency and danger are discussed. Cracking caused by sintering is referred to. MGL (24)

Further Notes on new Refractory Siemensit. (Weiteres über den neuen feuerfesten Baustoff Siemensit.) HANS HIRSCH. *Tonindustriezeitung,* Vol. 56, Nov. 17, 1932, pages 1147-1149. Results of tests on structure, elasticity, heat conductivity, temperature stability under normal conditions and under pressure, volume stability, stability against rapid temperature changes and basic as well as acid slags show that Siemensit is a refractory possessing properties superior to any other refractory for metallurgical furnaces. These tests fully substantiate practical tests in the open hearth furnace. GN (24)

Refractory Linings for Modern Blast Furnaces. MAURICE BARRETT. *Journal Society of Chemical Industry,* Vol. 51, Nov. 25, 1932, pages 972-973. Present trend in blast furnace linings is use of a relatively high aluminous material which author advocates for English use. Typical analyses of American, German and English blast furnace linings show:

	American	*German*	*English (from two districts)*	
Silica	51.50	54.70	74.40	64.92
Titanium oxide	-------	1.00	1.20	-------
Alumina	42.50	41.10	19.79	30.79
Ferric oxide	1.75	1.50	2.71	2.21
Lime	.23	.30	.10	.34
Magnesia	-------	.10	.05	.62
Potash	-------	.72	.78	1.35
Soda	-------	.30	.42	.33

VVK (24)

Sinterkorund. A Novel Ceramic Material. (Sinterkorund. Ein neuer keramischer Baustoff, besonders für Zündkerzen.) H. KOHL. *Deutsche Motorzeitschrift,* Vol. 9, Mar. 1932, pages 60-62. Favorable physical, thermal, chemical and and electrical properties of Sinterkorund are emphasized. This refractory material is prepared at 1800° C. from pure Al_2O_3 by Siemens & Halske Co., Berlin, by a new process giving a dense, sintered, crystalline body. Electric resistance at 400° C. is 100,000 times that of porcelain and 100 times that of molten quartz at 700° C. Besides utilization as insulation material, its remarkable chemical resistance is stressed. Sinterkorund is stable against HF, slags and melting alkalies, and it offers a valuable material for electric furnace construction. Its Mohs hardness is 9. EF (24)

Heat Flow in Refractories. F. H. NORTON. *Fuels & Furnaces,* Vol. 10, Nov.-Dec. 1932, pages 575-584. Thermal characteristics of heat flow and heat capacity of refractory materials are discussed with special reference to industrial furnaces and a few examples of temperature distribution and heat losses in furnace walls and recuperator and checker walls calculated. Ha (24)

Magnesite, Its Preparation for Brick Manufacture and Other Applications. (Magnesit in Anwendung für Steine und andere Zwecke.) KRAUSE. *Feuerfest-Ofenbau,* Vol. 8, Aug. 1932, page 121. Mining and preparation of magnesite is considered. Furnace temperature at which magnesite starts softening and crumbling is 1600° C. However magnesite proved to be superior to dolomite and lime bricks as basic furnace material due to its sluggish reaction with FeO and SiO_2. Magnesite crucibles are of commercial importance since they do not exert a directly reducing influence. They are used without a binding agent. Molded in a graphite mold, they are fired at 1500° C. in electric furnaces. Utilization in basic converters in Cu and Ni metallurgy and as substitute for bone ash crucibles in Ag metallurgy. However in Bi and Sb furnaces, chromite linings replaced those of magnesite. In contact with steam, calcined magnesia hydrates and decomposes. EF (24)

Protective Coatings in Combustion Chambers. (Schutzanstriche für Brennkammern.) G. LINDE. *Die Wärme,* Vol. 55, Jan. 9, 1932, page 27. The protection of refractories against the attack of fire gases, metal vapors and slags by "Pyroment" and "Pyroprotex" is dealt with. The basic Pyroment, used for basic furnace material, starts sintering at 1100° C. which process is finished at 1400° C. Beginning of melting takes place at 1680° C. Pyroprotex is brought on the market in 2 grades. Lower grade melts at 1150° C. and better one softens at 1790° C. Pyroprotex is intended for acid refractories and furnaces in which acid reactions take place. EF (24)

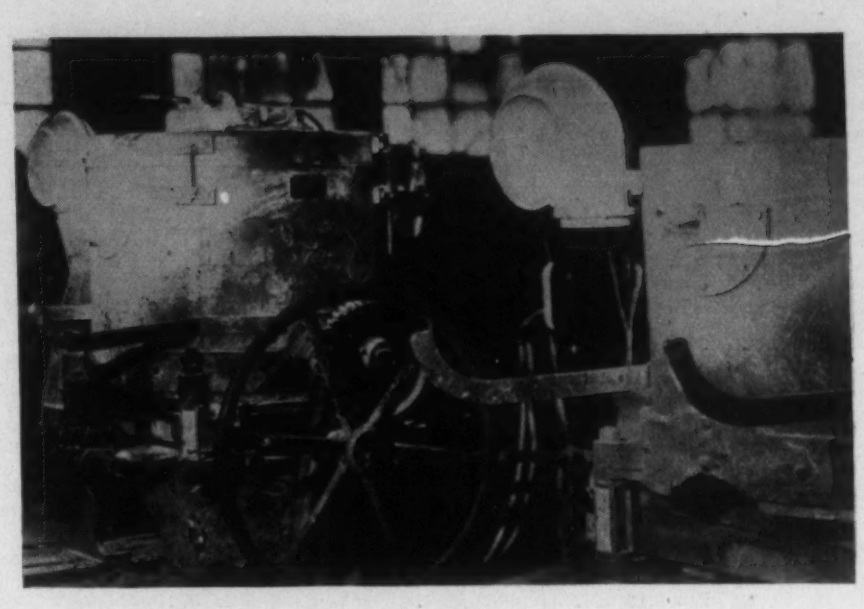
Selection of Refractories. F. H. NORTON. *Fuels & Furnaces,* Vol. 10, Sept.-Oct. 1932, pages 521-528, 538. Discusses properties of refractories and tabulates types of refractories best suited for various furnace conditions. Ha (24)

Magnesite and Its Manufacture. (Der Magnesit und seine Verarbeitung.) R. BANCO. Theodor Steinkopff, Dresden, 1932. Paper, 6 x 8¾ inches, 64 pages. Price 5.80 RM. A few pages are devoted to raw magnesite and caustic burned magnesite, for magnesia cement, but most attention is paid to the burning of the magnesite to sintered magnesite, its beneficiation by magnetic separation, and the manufacture and firing of magnesite brick. H. W. Gillett (24)-B-

Refractory Materials for Air-Heating Furnaces. ALFRED B. SEARLE. *Metallurgia,* Vol. 6, Aug. 1932, pages 133-134. Discusses most suitable refractories for regenerators and recuperators. JLG (24)

The Possibility of Sillimanite Minerals as Refractories. FRANK H. RIDDLE. *Transactions Electrochemical Society,* Vol. 59, 1931, pages 35-51. Includes discussion. See "Possibility of Andalusite as a Refractory," *Metals & Alloys,* Vol. 2, Sept. 1931, page 180. (24)

The Fabrication of Steel Plant Requisites. (Die Herstellung von Stahlwerksbedarf.) *Tonindustriezeitung,* Vol. 56, June 16, 1932, pages 623-624. The paper discusses the processing of the various refractory bricks used in steel pouring practice, such as sleeve bricks, nozzles, stoppers, spout bricks, etc. Unfortunately these bricks have not yet been standardized in Germany. GN (24)



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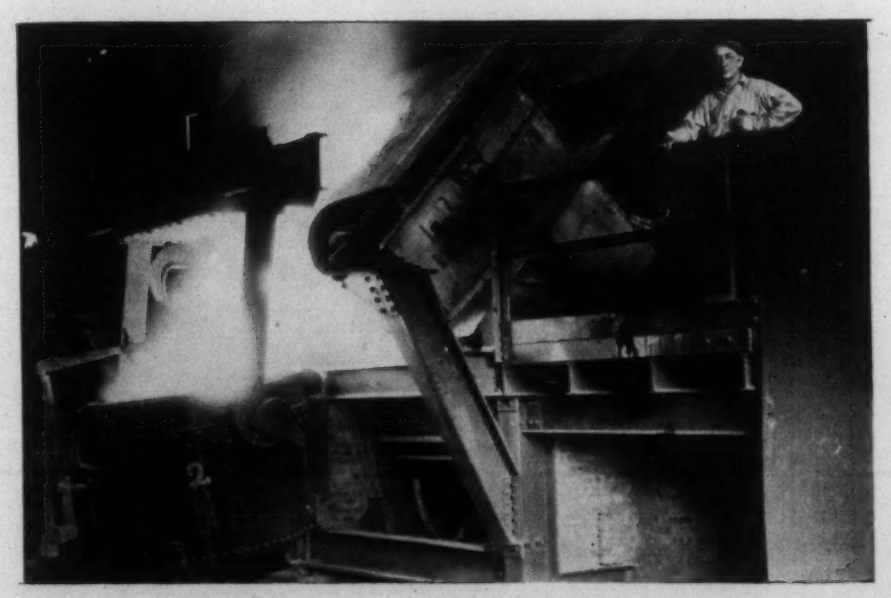

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NORTON REFRACTORIES

GASES IN METALS (25)

Photoelectric and Thermoelectric Effect of Hydrogen-Charged Palladium-Silver and Palladium-Gold Alloys. (Lichtelektrischer und thermoelektrischer Effektwasserstoffbeladener Palladium-Silber und Palladium-Goldlegierungen.) J. SCHNIEDERMANN. *Annalen der Physik,* Series 5, Vol. 13, June 1932, pages 761-779. The capacity of Pd and its alloys with Ag and Au to absorb H decreases linearly with the amount of added Ag or Au. The photoelectric and thermoelectric effects are increased by the absorbed H and show a maximum in the alloys with 40% Ag and Au. The experiments are fully described. Ha (25)

Heredity in Cast Irons—Oxidation Regarded as Heredity Factor. (Hérédité des Fontes—L'oxydation envisagée comme facteur d'hérédité.) Scientific Committee of the Belgian Foundry Association. Reporter: LEONARD. *La Fonderie Belge,* Vol. 2, Jan. 1932, pages 1-7. Paper read before the foundry convention of Milan, 1931. Literature dealing with the matter is reviewed. Differences in properties between cast irons of apparently similar chemical composition are noted. Defects are observed in test-pieces or castings cast with iron obtained under oxidizing conditions either in blast furnace (remelted in correct way) or in cupola. Oxidation decreases the running capacity of molten cast-iron. Oxidation decreases the amount of graphitization and size of graphite particles, i.e., increases strength but lessens strength of the matrix: The 2 effects are contradictory and the resulting one is variable. Oxygen determinations are delicate. The total O content is meaningless unless the form in which oxygen is present is known: oxides, gas dissolved or entangled in the matrix. FR (25)

The Influence of the More Common Elements in Inhibiting Needles in Nitrogen-Rich Steels and Arc Welds. L. W. SCHUSTER. *Engineering,* Vol. 133, May 20, 1932, pages 612-614. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 361. LFM (25)

The Influence of Melting Condition on the Occlusion of Gas in Aluminium Alloys. KOKICHI ITO. *Kinzoku no Kenkyu,* Japan, July 1932, pages 296 to 304. The influence of various melting conditions on the occlusion of gas or the presence of blowholes in the castings of Al alloys, namely "L. 8," "Y," duralumin, silumin and an alloy containing 4% Cu and 8% Si was determined by the measurement of specific gravity. It was found that melting at high temperature increases the amount of gas occluded, but the influence in the difference in melting time is comparatively small. The maintaining of melt at a temperature just above the liquidus prior to casting is very advantageous and practically sound castings are obtained by this method. Fluxes proved effective in obtaining sound castings. "Y" alloy castings contained many pinholes except when treated with $ZnCl_2$. The alloys treated with Cl gave good castings but those treated with N gave less sound castings. KT (25)

Ferromagnetism in the Manganese-Nitrogen System. (Das Auftreten das Ferromagnetismus im System Mangan-Stickstoff.) ROBERT OCHSENFELD. *Annalen der Physik,* Vol. 12, Jan. 1932, pages 353-384. When Mn is heated rapidly in an atmosphere of N_2, a rapid absorption of the N_2, which may amount to as much as 12.8 atomic %, occurs in the neighborhood of 1100° C. This absorption of gas is accompanied by the appearance of ferromagnetic properties. If the temperature is raised to 1300° C. or a little above, the N_2 is given up and the ferromagnetism disappears. The lattice of the magnetic Mn seems to be largely of the γ-type and the absorption of N_2 increases the lattice parameter from 3.772 to 3.857 A.U. The mixture seems to be a solution of N_2 in Mn and the enlargement of the lattice is a measure of the amount of gas absorbed. Throughout a considerable region the relation between lattice parameter and magnetizability is linear. Apparently although the γ-phase is not itself ferromagnetic, it facilitates the absorption of N_2 and hence is always associated with the appearance of the ferromagnetism. The β-phase suffers a contraction when N_2 is absorbed and seems to make little if any contribution to the ferromagnetism. The average transformation temperature for all the specimens was about 500° C., and some showed coercive forces as great as 200 gausses. Attempts to produce ferromagnetic Mn by causing it to absorb H_2 and solid C were unsuccessful. Heating Mn at 725° C. for 30 min. in an atmosphere of CH_4 produced slight ferromagnetism. A mixture of Mn and B containing 25 atomic % B was ferromagnetic but its lattice as indicated by X-ray patterns has not yet been worked out. Ha (25)

The Question of Oxygen in Iron. (Beitrag zur Frage des Sauerstoffs im Eisen.) JULIUS RESCHKA. *Mitteilungen aus dem Forschungs-Institut der Vereinigte Stahlwerke Dortmund,* Vol. 3, No. 1, 1932, pages 1-18. The investigations made so far to determine the influence of O on the properties of steel are reviewed and certain discrepancies in the results pointed out which are attributed to the fact that steel in a manufactured compact form was used in which the state of O was not exactly known. The present investigation was therefore made with samples of pure Fe powders compressed cold at 10,000 kg./cm.^{2} into little rods and sintered. Different contents of O from 0.087 to 10.57% were obtained by addition of certain Fe oxide powders. The method of testing is described in detail, the results can be summarized as follows: Machining was possible up to 3% O when hot. Manganous oxide reduced the hot deformation more than ferrous oxide. Fe sulphide reduced the forgeability considerably. The tensile strength of pure Fe-O alloys increased at first up to 0.2% and then decreased slowly. The toughness decreased with the O content but at 3% was still higher than that of cast Fe. The increase of the electric resistance due to P and S was very small. An increasing solubility with temperature of O in solid Fe could not be stated. Beginning at an annealing temperature of 600° C. an increase of the specific volume was observed. 30 references. Ha (25)

The Solubility of Gases in Metals. The Action of Hydrogen and Nitrogen on Aluminum. (Über die Löslichkeit von Gasen in Metallen. Das Verhalten von Wasserstoff und Stickstoff gegen Aluminium.) P. RÖNTGEN & H. BRAUN. *Metallwirtschaft,* Vol. 11, Aug. 19, 1932, pages 459-463; Aug. 26, 1932, pages 471-472. The results of other investigators on the solubility of H_2 in Al vary considerably due to difference in purity and methods of preparation of the metal and methods of measuring the dissolved gas. In these tests the metal was first degasified and then brought into contact with the gas at a definite pressure and temperature. A measurable amount of H_2 is absorbed in Al after the melting point is passed and increases as the temperature is increased. If the Al is slowly cooled in the H_2 atmosphere the volume of H_2 absorbed is reduced to that corresponding to the lower temperature. The volume of H_2 is directly proportional to the weight of Al and not related to the surface. The volume absorbed varies as the square root of the gas pressure. The tests were made on pure Al and on commercial Veral, with no difference in the results between the two. The H_2 is absorbed by the whole mass of Al, not by the surface layer only. In the commercial reduction of bauxite to Al and the remelting of Al in foundries larger volumes of H_2 than in these tests are absorbed due to different conditions. During the reduction of bauxite H_2O is liberated and nascent H is formed electrolytically and by contact with the hot metal which is readily soluble in Al. When such Al is remelted at fairly low temperatures with a protecting cover of oxide or slag the absorbed H_2 does not have much chance to escape and a larger volume is retained than in the tests made in an H_2 atmosphere. If the metal is stirred during remelting more H_2 will escape. Similar tests were made with N_2. The rapidity of N_2 absorption increases with the temperature of the Al. Just above the melting point the absorption stops after a short time while at higher temperatures it continues. When Al has once absorbed N_2 it is impossible to degasify it. The tests prove that between 700° and 1000° C. N_2 is not soluble in Al but that AlN is formed on the surface and retards further absorption. The AlN layer is so thin that it could not be detected under the microscope. 24 references. CEM (25)

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EFFECTS OF ELEMENTS ON METALS & ALLOYS (27)

Effect of Cadmium and Lead on Properties of Aluminum. (Über den Einfluss von Kadmium und Blei auf die Eigenschaften des Aluminiums.) B. Blumenthal & M. Hansen. *Metallwirtschaft,* Vol. 11, Dec. 9, 1932, pages 671-674; Dec. 16, 1932, pages 683-685; *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 87-93. Alloys of Al with 0 to 7.41% Cd and Al with 0 to 1.5% Pb were prepared by thoroughly stirring molten metal and casting in chill molds to prevent segregation of Cd and Pb. Al containing more than 5% Cd forms 2 layers in molten condition. Samples were examined by X-rays to insure good dispersion of alloying elements. Both Al-Cd and Al-Pb alloys can be hot and cold rolled, forged, and drawn without difficulty. Cd increases tensile strength in normalized condition slightly and has no effect on elongation and bending test. When quenched at 600° C. and aged at 150° C. effect is greater. With .56% Cd aged for 3 days tensile strength is raised from 8.2 to 13.5 kg./mm.^{2}, while elongation and bending test are lowered considerably. Brinell hardness is increased from 23 to 38. Higher Cd contents do not make much change. Electrical conductivity is lowered very slightly by Cd additions. Addition of Pb to Al has no effect on its mechanical properties. Corrosion resistance of Al against seawater is not altered by addition of Pb. Machining properties of Al and Al-Cu alloys are improved by Pb. 12 references. CEM (27)

The Effect of Carbon on the Critical Points and the Hardness of Nickel-Chromium Steels. Takejiro Murakami & Miwakichi Mikami. *Kinzoku no Kenkyu,* Vol. 9, June 1932, pages 225-238. By adding C to steel containing 3.21% Ni, 0.96% Cr and 0.31% C, 6 specimens with several C contents below 1.11% and constant Ni and Cr contents were prepared. The normal critical points of these specimens were determined by measuring the thermal expansion. The A_3 point of these steels gradually decreases as the C content increases, though the A_1 point is nearly constant. The effect of C on the critical points due to the maximum heating temperature and cooling rate was studied by magnetic analysis. As the maximum heating temperature or the cooling rate increases the critical point is markedly lowered, resulting in self-hardening. The self-hardening ability increases, as the C content increases up to 0.8%, though the more C is contained in specimen, the more conspicuous is the lowering of the critical point, if the cooling rate is more rapid than the air-cooling. The hardness of the Ni-Cr steels increases, as the cooling rate increases, or C content increases up to 0.8%. The hardness of the oil-quenched or air-cooled specimens from different high temperatures was studied. By oil-quenching, from 800° C. high C specimens are sufficiently hardened, though low C specimens require higher quenching temperatures than 850° C. to be sufficiently hardened. By air-cooling, the low C specimens are not hardened irrespective of heating temperatures, though in the high C specimens nearly equal hardness to that of oil-quenched specimens is obtained, if the heating temperature exceeds 850° C. The change of hardness due to the tempering of oil-quenched specimens was also measured. In low C specimen, the hardness does not change up to 350° C., though in high C specimen the hardness decreases somewhat on heating to 200° C., and gradually decreases on further heating. The microstructure of these specimens cooled under different conditions was examined and the relation between the structure and the cooling curve or hardness was studied. TM (27)

Effect of Sulphur in Cast Iron. (Influence du Soufre dans la Fonte). L. Piedboeuf & J. R. Marechal. *Bulletin de l'Association Technique de Fonderie,* Vol. 6, Apr. 1932, pages 132-134. Abstract from *Bulletin de l'Association Technique de Fonderie de Belgique,* Dec. 1930. Extensive study of the form in which S is present in cast Fe. Effect of S on properties of cast Fe. S is a very deleterious element. Researches on desulphurization in cupola, in forehearth, in ladles, in blast furnace and in mixer. 14 references. FR (27)

Phosphorus in Red Brass. R. W. Parsons. *Transactions American Foundrymen's Association,* Vol. 3, May-June 1932, pages 47-62. P in red brass actually serves as a deoxidizer in addition to making the metal fluid and protecting the molten stream during pouring. Various theories are presented as to the mechanics of this deoxidation. About 0.05 to 0.1% phosphor Cu are required for an alloy containing 8.5% Zn. CHL (27)

Influence of Silicon, Phosphorus, Aluminum, Nickel and Chromium on the Quasi-Isotropy and the Wall Thickness Sensitivity of Cast Iron. (De l'influence du silicium, du phosphore, de l'aluminium, du nickel et du chrome sur la quasi-isotrophie et la sensibilite de l'epaisseur de la fonte.) E. Piwowarsky & E. Soehnchen. *La Fonte,* Jan. 1932, pages 96-99. Summarized translation of a German article. See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 25. FR (27)

Arsenic in Ternary Lead Base Bearing Alloys. K. H. Wegner. *Metals & Alloys,* Vol. 3, May 1932, pages 116-119. The author reports a study of the effect of As in a bearing metal 75% Pb, 10% Sn, and 15% Sb. The addition of As affects the shape of the Sb-Sn compound producing them in a needle shape with a core of an As rich material. The addition of As in amount of about 1.60% effectively reduces segregation in the alloy. 8 references. WLC (27)

The Influence of Nickel on the Properties of Cast Bronze. (Der Einfluss von Nickel auf die Eigenschaften von Gussbronze.) *Die Metallbörse,* Vol. 22, Feb. 27, 1932, pages 258-259. 1% Ni improves the casting and physical properties of bronze but only about 10% Ni materially improves the corrosion resistance. Replacing Sn by Ni, 1% of the latter raised the m.p. for about 18° C. The density and grain are improved by Ni which also increases the solubility of Pb. With regard to the physical properties, data are given which were determined by Pilling and Kihlgren showing the beneficial effect of Ni. This effect however is somewhat dependent on the Pb+Sn content. The grain of special brass and gun metal is only influenced appreciably by at least 3% Ni. The best results in 89/11 CuSn alloys are secured by adding 2% Ni. A beneficial effect due to 1.5% Ni in gun metal with 8% Sn and 4% Zn is noticed but the proportional limit and ultimate strength are increased up to 5% Ni. Pb-bearing red brass is strongly affected by Ni additions. Bearing bronzes with 10% Pb are improved by 1.5% Ni and 1% Ni is sufficient in the 20% Pb-bearing alloy. EF (27)

The Effects of Small Additions of Chromium on the Properties of Iron-Carbon Alloys. (Beitrag zur Kenntnis der Wirkungen geringer Chromzusätze auf die Eigenschaften von Eisenkohlenstofflegierungen.) H. Rudolph. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 1, Oct. 1931, pages 152-162. The literature on this subject is reviewed and on the basis of the information given therein it can be stated that Cr influences the hardness of a C-Fe alloy in a 2-fold manner: (1) directly by increasing the ferrite hardness and (2) indirectly by increasing the content of combined C. The higher the content of combined C of a Cr-free Fe-C alloy, the less can the hardness be increased by small additions of Cr. Ha (27)

Influence of Some Impurities on the Properties of Silver Solders. (Einfluss einiger Verunreinigungen auf die Eigenschaften der Silberlote.) *Die Metallbörse,* Vol. 22, Feb. 6, 1932, pages 161-163. Due to their favorable melting point of 700°-870° C., an increasing demand for Ag-solders can be noticed. Only highly pure metals should be employed for the manufacture of these solders. The detrimental effect of Fe is stressed. Cu and Zn should be added to the molten Ag in the form of brass. In spite of its low melting point, Cd actually increases the melting point of Ag-solders, but on the other hand, Cd improves the ductility of the solder. Sn materially reduces the m.p. but, in case of larger concentrations, Sn increases the hardness and brittleness. The opinions on the influence of Ni, Mn, Si and P, which are added occasionally, are still divided. 2 tables are included in the paper, showing analyses and melting point of various Cd and Sn bearing Ag-solders. EF (27)

The Influence of Ni on the Heat-treatment of Gray Cast Iron. Y. Yamamoto. *Bulletin Institute of Physical & Chemical Research,* Vol. 10, Nov. 1, 1931, pages 537-555. Change of hardness of Ni-alloyed gray cast Fe after heat treatment such as annealing and quenching was studied. 10 kinds of gray cast Fe containing about 3.5% C, 2.5% Si, 1.2% Mn, and 0-3.0% Ni were used in present investigation. Strength and hardness of gray cast Fe are increased on adding over 1% Ni. Among specimens which were annealed at various temperatures, those heated above 750° C. showed remarkable decrease in hardness. The diminution of the hardness was greater in Ni-rich cast irons than in those of Ni-poor ones. Among specimens quenched in cold water from various temperatures, those quenched from 700°-780° C. showed a remarkable effect of this treatment. Further, critical point in these specimens was determined by differential thermal analysis. As critical point descends with increase of Ni content, proper quenching temperature should be lowered. Hardness of specimens which were quenched from above 850° C. was almost same irrespective of Ni content. So far as experiments of heat treatment of Ni-alloyed cast Fe were carried out, any advantage of addition of Ni to it could not be found. TS (27)

Nickel in Steel Castings. F. Johnstone Taylor. *Foundry Trade Journal,* Vol. 47, Aug. 18, 1932, page 99. A résumé of recent developments in the use of Ni in steel castings. OWE (27)

Considerations on Aluminum Bronzes—Effect of Iron on Crystal Size. (Considérations sur les Bronzes d'Aluminium—Influence du Fer sur la Dimension des Cristaux.) C. Vickers. *Bulletin de l'Association Technique de Fonderie,* Vol. 5, May 1932, pages 161-162. A summarized translation. See "Iron Reduces Crystal Size in Aluminum Bronze," *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 25. FR (27)

Casting Properties of Nickel Bronzes. N. B. Pilling & T. E. Kihlgren. *Transactions American Foundrymen's Association,* Vol. 3, Sept.-Oct. 1932, pages 289-309. Effects of Ni on common foundry mixtures are described. Though Ni brings a rise in melting point, it frequently increases fluidity, usually diminishes grain size by about 50%, and widens useful range of pouring temperatures. Piping and linear shrinkage are not affected. Less than 3% Ni in general, accomplishes useful effects. CHL (27)

The Diffusion of Molybdenum into Tungsten. (Die Diffusion von Molybdän in Wolfram.) J. A. M. van Liempt. *Recueil des Travaux Chimiques des Pays-Bas,* Vol. 51, Jan. 15, 1932, pages 114-132. Mo was deposited on W cores of polycrystalline and single-crystal wire by heating cores in mixture of $MoCl_5$ vapor and H at 800° C. Results showed that at same temperature, diffusion of Mo into W is less for single-crystal wire than for polycrystalline, and rate of diffusion increases at higher temperatures. General formula was derived for diffusion of 2 regular, single crystal metals which form continuous series of solid solutions. Diffusion of Mo in polycrystalline W depends on grain size and total surface of W as well as on condition of grain boundaries and can therefore not be represented by any general formula. 25 references. Ha (27)

Influence of Mn on the Mechanical Properties of Rolled Carbon Steel. Masatoshi Jo & Shunichiro Nagai. *Seitetsu Kenkyu,* Nov. 5, 1932, pages 171-193. Using 10,212 specimens prepared from 8328 kinds of rolled C steels (0.20-0.70% C, 0.4-1.7% Mn) which were made in basic open hearth furnaces in Imperial Steel works of Japan from 1927 to 1932, relations between Mn contents and tensile strength, elongation, and Brinell hardness were studied. Following results were obtained: When C-content is constant, tensile strength of rolled C steels increases with Mn content, and when Mn content is constant, it increases as the C content increases. Relation between tensile strength and Mn and C contents in rolled C steels is shown in the formulas,

$$T = 0.36\ C + 0.006\ C{\cdot}Mn + 0.02\ Mn + 32$$

where T is tensile strength in kg./mm.^{2} C is percentage $\times$ 100 C, Mn is percentage $\times$ 100 Mn. Elongation of specimens (dia. 14 mm., G. L. 50 mm.) decreases as Mn or C content increases, when C or Mn contents is constant. Following formula is deduced,

$$E = \frac{380}{C} - 0.0022\ C{\cdot}Mn + 17.6$$

where, E is Elongation (%). Brinell hardness (10 mm. ball, 3000 kg. load) of these steels changes similarly as tensile strength. Hardness is represented by the formula,

$$B = 1.1\ C + 0.018\ C \cdot Mn + 0.04\ Mn + 86$$

where, B is Brinell Number. TS (27)

Diffusion of Sulfur, Manganese, Phosphorus, Silicon, and Carbon through Molten Iron. W. L. Holbrook, C. C. Furnas & T. L. Joseph. *Industrial & Engineering Chemistry,* Vol. 24, Sept. 1932, pages 993-998. It was found that rate of diffusion is much faster at beginning of a test than later. Distance to which a measurable amount of an element will diffuse in 30 min., is almost as great as it will be in 3 hours. Rate of diffusion apparently follows same laws as heat conduction along an insulated rod. Adequate agitation should be maintained in a bath in which chemical elements are being transferred to or from a molten bath of Fe. MEH (27)

Improvement of Black Heart Malleable Iron by Small Aluminum Additions. (L'Amélioration de la Malléable Américaine par des Petites Additions d'Aluminium.) J. Hruska. *Bulletin de l'Association Technique de Fonderie,* Vol. 5, May 1932, pages 162-163. A summarized translation. See "Aluminum Improves Malleable Cast Iron Properties," *Metals & Alloys,* Vol. 3, May 1932, page MA 147. FR (27)

On the Primary Graphitization in Castings Containing Molybdenum (Sur la graphitisation primaire des fontes au molybdène). Jean Cournot & Jean Challansonnet. *Comptes Rendus,* Vol. 195, July 4, 1932, pages 46-48. An experimental study shows that it is possible to add up to 2% Mo to gray cast Fe without causing liberation of free C. In spite of rapid cooling the casts remain gray. When the addition reaches 2.9%, the free C diminishes progressively, giving complex cementites. Nodular graphite was found only in castings of small thickness. The results of work by other authors are criticized. OWE (27)

The Influence of Silicon on Copper-Nickel Alloys of Low Tin Content (L'influence du silicium sur les alliages cuivre-nickel à basses teneurs en étain). Leon Guillet, Marcel Ballay & A. Le Thomas. *Comptes Rendus,* Vol. 195, July 11, 1932, pages 89-92. Series of ordinary bronzes with about same Sn content (6.5%), but with increasing proportions of Si, was investigated from point of view, chiefly, of mechanical strength; coefficient of equivalence for Si with respect to Sn (approximately 3) was also determined (for Cu-Ni alloys of high Ni content, see *Comptes Rendus,* Vol. 194, 1932, page 2102). Hardness of various Ni-Sn alloys was determined and effect of substituting Si for Sn estimated. OWE (27)

Cast Irons with Higher Nickel Additions. A. B. Everest. *Iron & Steel Industry & British Foundryman,* Vol. 5, Apr. 1932, pages 265-268; May 1932, pages 310-313. The more recently developed high alloy cast Fe possessing the martensitic and the austenitic structures are dealt with. Cylinder liners of 5 and 6% Ni, cast Fe, though of 400 Brinell hardness, were amenable to machining and had a wear life 7 or 8 times the life of ordinary cast Fe. With mild heat treatment cast irons of intermediate Ni percentages produce desired results. Oil quenched cast Fe with about 2.5% Ni and 1% Cr find immediate commercial application for the wear resisting and other useful properties of the martensitic type of structure. Some of the outstanding properties of the austenitic cast Fe "Nomag" containing 13.5% Ni, 6.5% Cu and up to 6% Cr are its corrosion resistance, erosion resistance, heat resistance, non-magnetic properties, high electrical resistance and high coefficient of expansion. See also *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 89. CHL (27)

INSTRUMENTS & CONTROLLERS (28)

The Permeability of Ceramic Pyrometer Tubes for Gas in Relation to the Temperature. (Gasdurchlässigkeit von keramischen Pyrometerrohren in Abhängigkeit von der Temperatur.) H. Eck. *Gas und Wasserfach*, Vol. 75, July 23, 1932, page 614. Abstract of an investigation by H. Miehr in *Berichte der deutschen keramischen Gesellschaft*, Vol. 12, Oct. 1931. The tests with air on various protective pyrometer tubes show that the permeability of all of the tubes examined decreases with increasing temperature. This can be explained only by the increase of the viscosity and volume of the air passing through the tube which supposition was proved by tests. The same holds true for CO_2, N and producer gas. Similar results were obtained on thick-walled tubes. GN (28)

Determination of Gas Consumption of a Pusher Furnace by Means of Quantitative-Differential Measurements. (Gasverbrauchmessungen an einem Stossofen durch Mengenunterschieds-Messungen.) Walter Ruppert. *Stahl und Eisen*, Vol. 52, July 7, 1932, pages 665-666. A quantitative-differential meter is illustrated and described for measuring furnace gas consumption. The principle of the Relay Gas Counter is employed. In the hookup a secondary meter is connected to 2 primary units, the latter being installed in the main gas line before and after the gas take-off, similar to the ordinary differential gas meter. Only a small amount of gas passes through the secondary meter, proportional to the difference in pressure between the 2 primary units. The gas used is given directly by the secondary meter. Test results indicate a high degree of accuracy. DTR (28)

Handbook of Industrial Temperature and Humidity Measurement and Control. M. F. Behar. Instruments Publishing Co., Pittsburgh, 1932. Cloth, 6¼ x 9½ inches, pages 113-420. Price $4.00. This book comprises parts 2 and 3 of the comprehensive "Manual of Instrumentation." Part one, "The Fundamentals of Instrumentation," was brought out earlier in the year. In this text Mr. Behar has kept constantly in mind the object of providing a practical handbook for industrial use. Accordingly, the theoretical aspects of the subjects are presented very simply and rather briefly. The author has assembled a large amount of valuable information, and has put it in readily usable form. The Handbook is well printed, on good paper, the cuts are clear, and the binding permits the volume to lie open on the desk for reference. The reviewer believes that this Handbook will be found to be very useful and suggestive by anyone who has to do with temperature and humidity measurement and control. The Handbook contains 7 chapters on temperature, 4 on humidity and 9 appendices. After presenting some general ideas on temperature, the subjects of thermometers, thermoelectric, radiation and optical pyrometers, recorders, automatic temperature control, and control instruments and accessories are discussed in detail. There is a careful classification of types of the different kinds of instruments, and in the different classes some of the more important makers are listed, and their instruments described, many cuts being used. The methods of use and precautions in use are also given. These descriptions seem to have been brought remarkably well up to date. The section on humidity presents first general data, and the impo[illegible] of humidity; second, information in regard to humidity measurement and charts; third, humidity and aerological measuring instruments, and fourth, the automatic control of humidity. The appendices include temperature conversion tables, data on the checking of pyrometer installations, thermocouple constants for practical couples, psychrometric and humidity tables, etc., etc. S. L. Goodale (28)-B-

On the Calibration of Thermo-couples at High Temperatures. Keizo Iwasé, *Kinzoku no Kenkyu*, Japan, Aug. 1932, pages 321-327. The author proposed titanite ($CaOTiO_2SiO_2$) and Li_2SiO_3 as calibration materials between 1000° and 1600° C. rather than diopside ($CaOMgO2SiO_2$). The operation is as follows:—Pure $CaCO_3$, TiO_2 and SiO_2 are melted together in a small Pt crucible and the temperature is raised 150° to 200° C. higher than the melting point. After the melt is stirred well with Pt wire, it is cooled slowly to nearly its melting point. Then a cooling curve is taken; the cooling velocity must be less than 10° C./Min. When the melt was super-cooled about 10° C. below the melting point, a nucleus, consisting of the same material, was put into the melt. Then a great heat evolution takes place and the temperature rises to the true melting point. It is necessary to be careful not to supercool too much below the melting point, otherwise the true melting temperature is not observable. Bare Pt-Pt Rh thermocouple is immersed in the melt. Li_2SiO_3 and diopside are used in the same way, but as the latter is very viscous and it is very difficult to keep the whole melt at the same temperature, the cooling velocity must be 1 ~ 2° C./min. The melting points obtained in this way are:—Li_2SiO_3 1201° C., titanite 1382° C., diopside 1391.5° C. The eutectic temperature of Ni and C was determined from the above calibration temperatures as 1324° C. KT (28)

The Heat of Formation of Calcium Meta-Silicate (Wollastonite) and Iron Ortho-Silicate (Fayalit.) [Bildungswärme von Metakalziumsilikat (Wollastonit) und Ferroorthosilikat (Fayalit).] Walter A. Roth & Horst Troitzsch. *Archiv für das Eisenhüttenwesen*, Vol. 6, Aug. 1932, pages 79-83. A new calorimeter constructed of silver, gold, platinum, rubber and amber is illustrated and described in detail. In this calorimeter the components of slags and cement may be dissolved in sufficiently rapid time at 77° C. in a mixture of 20% HCl and HF. For quartz alone an auxiliary measurement is necessary in 20% HF. The heats of formation of calcium meta-silicate (artificial Wollastonite) and of iron ortho-silicate (Fayalite) were measured from the metal oxides and α-quartz. The values found were +21.0 and +10.3 kg.cal. at 77° C. These values were calculated further for higher temperatures. The heat of transformation of amorphous silicic acid, dried at about 550° C., in α-quartz is found to be +3.51 kg.cal. at 77° C. The application of this new calorimeter for research work in thermochemistry of still other slagging fluxes appears feasible. DTR (28)

Automatic Control of Electric and Gas Furnaces. (Régulation automatique des fours électriques et à circulation de gaz.) *Journal du Four Electrique*, Vol. 41, Sept. 1932, pages 334-336. Mechanical features of Hartmann and Braun controller are given. JDG (28)

Electronic Devices in a Testing Laboratory. Clayton H. Sharp. *Electronics*, Vol. 5, Sept. 1932, pages 284-286. The advantages of employing electronic devices for increasing the sensitivity and accuracy of measurements in a testing laboratory are pointed out; amplifiers to aid in photometry and temperature control, measurements of radio tube characteristics, and in colorimetry described. Ha (28)

Wire Cable Research. (Drahtseilforschung.) *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, June 4, 1932, pages 557-560. A report of the committee for wire rope research describes a very sensitive electromagnetic measuring method for the determination of wire defects not externally visible; the defects are recorded graphically. Experiences on the life time of boisting cables, load balance between cables and a draft of rules for the periodic examination of hoisting cables are described. Ha (28)

Electron Tubes in the Steel Industry. L. F. Worden. *Iron & Steel Engineer*, Vol. 9, Mar. 1932, pages 136-142. Photoelectric tubes, Photron tubes, and thyratrons are briefly explained and their uses in steel industry outlined. Ha (28)

The Calibration of Temperature Measuring Instruments in the Hardening Shop. (Die Prüfung von Temperatur Messinstrumenten in der Härterei.) Herbert Mueller. *Die Messtechnik*, Vol. 8, May 1932, pages 101-103. The different possibilities of defects and errors of temperature measuring instruments are explained and suggestions made for their permanent and simple supervision. The Pt-Pt Rh thermocouple together with precision millivoltmeter is considered the most suitable for checking purposes. For checking certain points the well established melting temperatures of some metals are given. Ha (28)

Correct Measurement and Marking of Welded Seams. (Richtiges Messen und Anreissen von Schweissnähten.) H. Schmuckler. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, July 30, 1932, page 761. A new measuring instrument which measures directly the width of the fillet or welded seam and the thickness of the fillet. The same instrument can be used for marking where the welder is to work. Ha (28)

Investigations of Very Short-Time Phenomena in Industry. (Kleinzeitforschung in der Technik). W. Ende. *Zeitschrift Verein deutscher Ingenieure*, Vol. 77, Jan. 7, 1933, pages 10-12. Great importance of cinematographic investigation of technical phenomena occurring in a very short time is discussed and methods for time-magnification are described. Mechanical motions can be analyzed quite well with picture frequencies up to 1000/sec., electric arcs about 10,000/sec.; it is however possible to take up to 60,000 pictures/sec. Several examples of short-time measurements are illustrated. 9 references. Ha (28)

Thermo-electric Temperature Measurements up to 2000° C. (Thermoelektrische Temperaturmessung bis 2000° C.) W. Goedecke. *Die Chemische Fabrik*, Oct. 5, 1932, pages 361-364. Thermocouples can be used in the entire range of —200° to +2000° C. Up to 100° C. pure Te with Pt or other metals is used. Up to 300° C. Te alloys, such as 99% Te, 1% Sb, with Pt. Up to 600° C. Fe with constantan and up to 1000° C. the Ni-Cr alloys. The last 2 are subject to variation in thermal resistance in continuous operation. Pt-Re thermocouples have recently been developed which are not subject to these variations and are good up to 1600° C. They are also better than Pt-PtRh couples. Up to 1400° C. Pd-Fe Cr Al alloy couples can be used. They are especially suitable for immersion pyrometers. Above 1600° C. Mo-Fe alloy with pure W is used. With suitable gas tight protection tubes they may be used up to 2200° C. CEM (28)

New Micromanipulator (Nouveau micromanipulateur). P. de Fonbrune. *Comptes Rendus*, Vol. 195, Oct. 10, 1932, pages 603-604. Instrument is composed of 2 parts. One of them carries the micro-instrument (needle, pipette, etc.) and communicates to its movements in 3 directions in space, these movements being obtained by deformation of 3 flexible metallic diaphragms. Each diaphragm covers a cell in which the air pressure can be varied by means of a small pump. Second part of instrument is composed of 3 pumps and a single lever in nature of a Cardan joint; this permits pumps to be operated singly, in pairs, or all together. Pumps and diaphragms are so arranged that motions observed in microscope are in same direction as those impressed on lever. OWE (28)

Special Fixtures Facilitate Checking Ball Bearings for Dynamic Balancer. *Iron Age*, Vol. 129, Feb. 1932, pages 390-391. Ball bearings used in rollers and head-stocks of precision balancing machines built by Gisholt Mach. Co., Madison, Wisc. must meet exacting requirements. To avoid any inaccuracy all ball bearings are carefully inspected by fixture consisting of a spindle driven by a fractional horsepower motor through worm gearing and mounted in a journal outside of which are suitable attachments to support a dial indicator. Ends of journal spindle constitute tapered gages for bores of bearings inspected. Bearings are also inspected for friction and for presence of foreign matter. VSP (28)

The Fahy Low-Mu Permeameter for Measuring Low Permeability. *Iron Age*, Vol. 130, Sept. 1, 1932, page 330, adv. sec. page 18. Instrument for low permeability testing capable of both high accuracy in measurement and precision in observation developed by Frank P. Fahy, New Rochelle, N. Y. The permeameter consists of a solenoid having a removable plunger carrying 2 test coils of many turns of wire so arranged as to be positioned at center of length of solenoid. An important feature is control, which permits exact balance of 2 test coils. Calibration means are provided so that when specimen is in place and current in solenoid reversed, galvanometer deflection resulting from flux variations in coils will be proportional to intrinsic induction in specimen. VSP (28)

Use of Rider Gage. (Zum Gebrauche der Reiterlehre.) G. Berndt. *Feinmechanik und Präzision*, Vol. 40, Dec. 1, 1932, pages 199-201. Care must be exercised in use of rider gages in measuring diameters as they are exact only for correct circular or elliptical sections. Theory of errors of measurements is explained. Ha (28)

New German Telescope Permits Study of Inside Tube Walls. *National Petroleum News*, Vol. 24, Nov. 16, 1932, page 24. An instrument, called the Tube Wall Telescope, has been recently developed by Carl Zeiss of Germany for inspecting the inside of tubes. The telescope consists of a main tube with one or more extensions, reflecting heads and lenses, supporting mechanism to hold the telescope in the center of the tube and electric lighting for illuminating the section of the tube wall within the field of the telescope. It is also equipped for photographing any section of the tube wall. Made in two sizes, No. 1 for small tubes up to 1.6″ diam. permitting 24′ inspection and No. 2 for tubes from 1.5″ diam. up permitting 40′ inspection. VVK (28)

Temperature Regulators in Metallurgy. (Les régulateurs de température en métallurgie.) *Journal du Four Electrique*, Vol. 41, Nov. 1932, pages 420-423. Structural features of Chauvin Arnoux temperature controlling apparatus of thermocouple and radiation type are given. JDG (28)

Photo-Electric Control Equipment in Tube Mills. *Metal Industry*, London, Vol. 41, Sept. 9, 1932, pages 251-252. Journey of hot tubes from sizing rolls to cross rolls is automatically controlled by an Osram photocell equipment activated by rays of hot tubes so that stoppage or interruption due to mechanical faults in the rapid succession of tubes in the mill is avoided. Ha (28)

Pyrometers for the Iron and Steel Foundry. R. T. Rolfe. *Iron & Steel Industry & British Foundryman*, Vol. 6, Dec. 1932, pages 117-120. Brief description of instruments used in foundry for measuring temperatures. CHL (28)

Measuring Temperature of Flowing Gases in Furnace Systems. A Comparison Between Ordinary Thermocouple and Aspiration Pyrometers. M. Parkin & F. Winks. *Journal Society of Glass Technology*, Vol. 16, Sept. 1932, pages 315-326. Errors to which ordinary thermocouple measurements are liable, especially due to radiation from walls, are pointed out and suction pyrometer is described which eliminates such errors by promoting heat exchange between gas and couple as former is sucked rapidly past latter. Comparative results show that divergence of indications increases with diameter of thermocouple. Construction of Schmidt-pyrometer is described. Ha (28)

Electro-Plating Rheostats. F. Peasgood. *Metal Industry*, London, Vol. 41, Sept. 30, 1932, pages 327-329. Construction details and design of rheostats for adjusting currents up to 1600 amp. at low voltages in connection with electrolytic baths. Ha (28)

Overload Protection by Bi-metal Relays (Ueberlastungsschutz durch Bimetallrelais). G. Nathorff. *Siemens-Zeitschrift*, Vol. 12, Dec. 1932, pages 436-440. The different types of bimetal-relays for instantaneous and delayed action are explained and several examples described. Ha (28)

Quality Number of Permanent Magnets. (Güteziffer permanenter Magnete). H. Neumann. *Archiv für Technisches Messen*, Vol. 2, Oct. 1932, section V956-1, pages T148-149. Characteristics of a permanent magnet, i.e. its demagnetization factor, coercive power, true and apparent remanence, its energy are defined and methods of measuring these quantities and instruments used described. Tables of measured values of magnets of Co-Cr-steel, W-, and Co-steels are given. 10 references. Ha (28)

Natural Length of Thermometer Protective Tubes. (Naturliche Länge von Thermometereinsatzen). M. Lang. *Die Messtechnik*, Vol. 8, July 1932, page 163. Formula is developed which takes into account the heat conduction from the protective tube of a thermometer or thermocouple to the wall. Most economical length is called the natural length. Ha (28)

EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

The abstracts in this section are prepared in co-operation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M.

Testing of Materials for Service in High-Temperature Steam Plant. R. W. Bailey & A. M. Roberts. *Engineering*, Vol. 133, Feb. 1932, pages 261-265, Mar. 4, 1932, pages 295-298; Mar. 11, 1932, pages 306-307. There is a growing recognition by engineers interested in the use of metals at elevated temperatures, of the need for additional or new tests designed and defined to satisfy the requirements for high-temperature service. Too little is known concerning the effect of heat treatment on the behavior of metals at elevated temperatures. The change known as spheroidisation of the iron carbide or cementite is accompanied by a substantial reduction in the resistance to creep. For a steel of practically no C content no difference would be expected to occur. These conclusions are based on normalized steels in which the carbide is spheroidised afterwards by heating. If spheroidisation were brought about by a combination of cold-working and heating, although the spheroidised structure might be similar to that produced by heating alone, the authors would expect a greater creep rate than for the latter case, and therefore a greater reduction in operating temperature would be necessary. Another matter of fundamental importance associated with prolonged thermal action and stress is stability of cohesion. A failure of a material lacking this characteristic is usually associated with chemical action in some form, resulting in separation or weakening at the grain boundaries, and failure is likely to occur with little or no warning. The phenomenon of embrittlement is generally negligible in C steels, but has attracted considerable attention recently in certain alloy steels. The following facts appear now to be established: (1) 1.5-3.5% Ni results in a steel liable to embrittlement when Mo is under 0.70%. Steels with 5% Ni appear to be free from this defect. (2) 1-2% Mn produces an effect similar to that of Ni in (1). There are no data regarding the effect of Mo or other elements in inhibiting this condition. (3) Cu in small quantities, of the order 0.5%, certainly involves a liability to embrittlement. It is doubtful whether any experienced investigator now believes in the "limiting creep stress." There is a growing tendency to record creep test data by means of specific rates of creep and total creep. No mechanical tests upon apparently similar materials carried out by different laboratories have shown such disconcerting differences in their results as creep tests. A careful survey of the probable sources of error in early testing equipment suggests that faulty temperature control, distribution, and measurement have most frequently been responsible, although the design and arrangement of the extensometer, and to a less extent the testing machine, have often left much to be desired. The authors' apparatus will measure strain rates of 10^{-8} per hour within reasonable time. Temperatures are controlled at all temperatures up to 850° C. to within ± ½° C. Temperature distribution along the specimen is within ± 1 or 2° C. WAT (29)

The Properties of Commercial Varieties of Copper at High Temperatures. T. G. Bamford. *Institute of Metals, Advance Copy* No. 606, Sept. 1932, 9 pages. Some properties of 5 commercial coppers were determined at elevated temperatures. The materials were: P-Cu, P-As-Cu, P-Ni-Cu, tough-pitch As, and tough-pitch non-arsenical Cu. Alternating-stress tests were made by using a constant load and determining the cycles required to produce fracture at temperatures up to 600° C. Charpy impact tests were made at temperatures up to 800° C. Herbert time-hardness values were determined at temperatures up to 350° C. The results of these tests indicated that the materials investigated did not have a brittle range at elevated temperatures. The Ni-bearing Cu was considered to have the greatest resistance to alternating stresses at elevated temperatures. The fatigue tests do not give the endurance limits, as the cycles to fracture at a given load are used to evaluate the relative endurance properties. JLG (29)

The Thermal Characteristics of Black Heart Malleable Cast Iron. Tario Kikuta. *Tetsu to Hagane*, Vol. 18, Mar. 1932, pages 272-287. If the black-heart malleable cast Fe completely annealed is thermally treated as in the case of galvanizing, the casting becomes very brittle at room temperature; its fracture shows a white and metallic luster. Leslie H. Marshall studied this problem and later published it. The writer, also, has studied it about the same time. Marshall's investigation consists of only impact test on the specimens of black-heart malleable cast Fe quenched at various high temperatures. He found that if the casting is cooled in water at temperatures ranging from 300° to 550° C., the casting becomes brittle but he also discovered that a favorable method is to cool the casting quickly from 650° C. before galvanizing it in order to prevent this embrittlement. In the course of the writer's research, he got a result identical with Marshall's, but continued further study until he found an ideal annealing method to produce superior malleable cast Fe from white Fe castings. The malleable Fe castings produced were not brittle as result of heat-treatment as in the case of galvanizing although the heat-treatment at 650° C. is not given as recommended by Marshall. The writer afterward made impact tests at various temperatures on the specimens treated and untreated thermally. Microscopic tests were made on the same specimens. From these facts the theory for the embrittlement of black-heart malleable cast Fe was built up. TS (29)

The Effects of Frost on Water-Charged Lead and Copper Pipes. C. E. Larard & F. A. W. Oliver. *Engineering*, Vol. 133, June 10, 1932, pages 673-677. Describes experiments made with Pb and Cu pipes. Some tests were also made on tubes with couplings. Results show that no sealed Cu tube withstood more than 2 complete refrigerations of the inclosed water without fracture of the tube. Most of the Cu pipes burst on the first freezing. No water-charged Pb pipe fractured under 5 successive refrigerations. In one case 10 were required before tube fractured. Dead soft Cu tubes gave about the same results as the Pb pipe. These results are due to the fact that Pb has a greater ductility than Cu of the hard or moderately hard tubes used in the tests. LFM (29)

Torsion Modulus of Nickel at Elevated Temperatures Simultaneously Magnetized. (Der Torsionsmodul des Nickels bei höheren Temperaturen unter gleichzeitiger Magnetisierung.) W. Möbius. *Physikalische Zeitschrift*, Vol. 33, May 15, 1932, pages 411-417. The irregular changes in the elastic constants of ferro-magnetic crystals near the Curie Point, theoretically predicted by London, are confirmed for the torsion modulus of a Ni wire. According to Heisenberg, this phenomenon should be due to a release of valence forces. However, if the modulus is measured under the influence of a longitudinal magnetic field, the modulus at first shows a minimum with rising temperatures, next a maximum and then joins the straight line which approximately represents the modulus above the Curie Point in such a manner that the irregularity of the transition with rising field densities becomes considerably smaller. The release of valence forces presumed, the break should not become smaller but rather larger. Based on the measurements, it is concluded that the behavior of the elastic constants of ferro-magnetic materials near the Curie Point should not be interpreted on the basis of valence forces released, but referred to the fields of magneto-striction phenomena. EF (29)

The Strength at High Temperatures of Six Steels and Three Non-Ferrous Metals. H. J. Tapsell, A. E. Johnson & W. J. Clenshaw. *Great Britain Department of Scientific & Industrial Research, Engineering Research Special Report* No. 18, Apr. 1932, 44 pages. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 334. (29)

REDUCTION METALLURGY (31)

Practical Production of Sponge Iron by the Norsk-Staal-Method. (Betriebsmässige Erzeugung von Eisenschwamm nach dem Norsk-Staal-Verfahren.) Ivar Bull-Simonsen. *Stahl und Eisen*, Vol. 52, May 12, 1932, pages 457-461. Direct reduction of Fe ore to sponge Fe is made with either solid reducing agents, such as charcoal, or gaseous reagents, such as CO and H_2. The gaseous reducing agents give lower costs than solid reducers, are easier to purify of undesirable impurities such as S and P, and are simpler to operate. The direct gaseous-reduction method of the Norsk-Staal A/S. is explained and the large scale plant in Bochum is sketched diagrammatically and described. Composition of finished Fe sponge is not more than 0.025% total P and S, at least 90% reduction, 92 to 94% Fe and 1.2% C, which should be evenly distributed. C is advantageous in small amounts to reduce on secondary fusion the small amounts of oxides that are present in the sponge. DTR (31)

Modern Revolving Tube Furnaces—Sintering Plants. (Neuere Drehrohrofen—Sinteranlagen.) Joseph Paquet. *Stahl und Eisen*, Vol. 52, Mar. 3, 1932, pages 218-220. 2 modern rotary tube furnace-sintering plants, Arbed-Werke in Düdelingen and Terres-Rouges-Werke in Belval, Esch, are described thoroughly. The method of operation of the Belval plant together with results since September 1931 show that low cost and simplicity make the process suitable for treating blast furnace dust and similar finely divided materials containing Fe. No difficulties arise from variations in moisture content, grain size of raw materials, or C content. The product is between 2 and 6 cm. in grain size. The furnace is fired with blast furnace gas and uses 415 m.³/ton of product. The power required is 8.5 kw.hr./ton. DTR (31)

The Constitution and Processing of Nickel Sulphide and Nickel Arsenide. (Über die Konstitution und Verarbeitung des Nickelsteins und der Nickelspeise.) W. Guertler & W. Savelsberg. *Metall und Erz*, Vol. 29, Mar. 1932, pages 84-91. The systems Fe-Ni-S, Fe-Ni-As and Fe-Ni-S-O were examined metallographically and analytically. Ni is more closely related to As and S than Fe is, but after the formation of S and As compounds, Fe takes up a greater equivalent of S and As than Ni. In the Fe-Ni-S system the crystalline compounds $2FeS\text{-}Ni_2S_3$ and $2FeS\text{-}Ni_2S$ found by Bornemann could not be detected. They break up on cooling into an eutectic of FeS and Ni_6S_5 and some free Ni. In the system Fe-Ni-As the quasi binary constituents $FeAs\text{-}Ni_5As_2$ and $Fe_3As_2\text{-}Ni_5As_2$ are important as they form eutectics. Solid solutions separate from the melt along $Fe_2As\text{-}Ni_5As_2$ forming new crystals of $2Fe_2As.Ni_5As_2$ and $4Fe_2As.Ni_5As_2$, which form eutectoids among each other and neighboring crystals. In roasting Fe-Ni sulphide ores the phase poor in Ni was found to burn first, then FeS and finally NiS. 4 references. CEM (31)

The Production of Ferrosilicon in the Blast Furnace. (Erzeugung von Ferrosilizium im Hochofen.) E. Hirschbrich. *Feuerungstechnik*, Vol. 20, Jan. 15, 1932, pages 11-12. The author reports some practical observations in producing ferro-silicon in the blast furnace. GN (31)

The Musso Process for the Semi-Direct Production of Steel from Iron Ore. T. W. Hardy. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 189-195. The tests failed to demonstrate that the Musso process in its present state of development has any technical or commercial value. As an undeveloped sponge Fe process it possesses possibilities. The retort is heated externally with gases drawn from the retort. AHE (31)

The Rate of Reduction to Sponge Iron of a Typical Lake Superior Ore Under Certain Conditions in an Externally Heated Rotating Retort. T. W. Hardy & W. S. Jenkins. *Canada Department of Mines, Mines Branch, Report* No. 724, 1932, pages 200-202. In order to obtain a metallization of 90% or better in the Musso process 2¾ hrs. was required under the conditions of test. AHE (31)

Iron Sponge, Its Production and Use in Modern Steel Practice. Arvid Johansson. *Iron & Coal Trades Review*, Vol. 24, Apr. 8, 1932, page 599; *Jernkontorets Annaler*, Vol. 116, Feb. 1932, pages 43-61. The different reducing agents, solid C and gas, which may be employed for the reduction of Fe ore without smelting are discussed. 2 kinds of reducing gases are used in the Swedish plants, one a circulating gas with a very low N content, the other a producer gas practically free of CO_2 and at a temperature of about 1000° C. Different types of reduction furnaces are discussed. The ore may be very rich in Fe or a poorer lump ore, especially a siliceous hematite with about 45% Fe; in this case, the crude sponge must be concentrated, for instance, by the wet-magnetic method. The metallurgical importance of a thorough reduction and of a high and uniform quality of the sponge are stressed; otherwise when melted later in electric furnaces with only a small addition of pig Fe an inferior quality of the sponge may seriously affect the smelting process and the quality of the steel. HCD + Ha (31)

Manufacture of Chrome-Iron Alloys. "Wild" Direct Reduction Process. *Iron & Coal Trades Review*, Vol. 124, Feb. 5, 1932, pages 236-238. The Darlington Rustless Steel & Iron Co., England, now uses a process for direct reduction of the Cr ore into the Fe without using a ferro-chrome alloy. This is done in a Heroult electric furnace of 10 tons, which can make at least 5 charges of rustless steel/24 hours at an energy consumption of 650 kwh./ton. The ingots cast weigh 1100 to 3500 lbs. To obtain full corrosion resistance proper polishing of the material is essential. 4 different grades are made, with Cr contents of 12 to 30%. The arrangement of the plant is described in detail. Ha (31)

Nickel Steel from Sudbury Ores. *Iron & Steel of Canada*, Vol. 15, Mar. 1932, page 28. An abstract of a memorandum published by the Mines Branch of the Department of Mines, Ottawa, Canada, dealing with a semi-direct process for the production of Ni steel from ores such as occur in the Sudbury district, Canada. OWE (31)

The Decomposition of Metallic Sulphides at High Temperatures, especially of Antimony, Tin and Lead. (Über den Zerfall von Metallsulphiden im besonderen des Antimons, Zinns, Bleis bei höheren Temperaturen.) E. J. Kohlmeyer. *Metall und Erz*, Vol. 29, Mar. 1932, pages 105-113. Samples of 500 to 700 g. of metals and of metallic sulphides were heated in a C tube furnace in N_2 atmosphere. The boiling point of Pb was higher than the usually accepted figure of 1550° C. The boiling point of Sb is 1638° C. Sb_2S_3 melts at 540° C., begins to volatilize at 745° C. and decomposes with boiling at 1020° C. As the dissociation progresses the boiling point rises and the S content decreases. PbS and a $PbS\text{-}Sb_2S_3$ mixture act similarly but PbS dissociates more slowly than Sb_2S_3, SnS begins to boil at 1278° C., rising to 1290° C. Much more of the SnS dissociates than volatilizes. A small amount of SnS is soluble in molten Sn. A 1 : 1 mixture of PbS and SnS boils at 1260° to 1280° C. After melting there is not as much difference in its composition as in a $PbS\text{-}Sb_2S_3$ mixture. Cu_2S was heated as high as 1675° C. without any change. Cu_2S is soluble in molten Pb; the lowest melting point is 542° C. in a 1:1 mixture. The composition of the mixture influences the dissociation and boiling point. The volatilization of PbS is decreased more than the dissociation by Cu_2S additions, Bi_2S_3 volatilizes and dissociates. FeS dissociates partly without boiling. 23 references. CEM (31)

Failure of Blast-Furnace Linings. Chas. L. Beattie. *Iron & Coal Trades Review*, Vol. 124, Feb. 12, 1932, pages 273-274. The destruction of the linings of blast furnaces, particularly in the Middlesborough district (England), was found to be due (1) to the alkaline constituent of the gas when it is passing at a comparatively high speed and high temperature; (2) to a concentration of alkaline matter at the points in the brickwork where the temperature is reduced to 780° C. Means for obviating these effects are discussed. Ha (31)

REVIEWS OF

MANUFACTURERS' LITERATURE

Tool and Alloy Steels

An attractive circular from the Firth-Sterling Steel Company lists their tool steels and stainless steels, giving a short description of each type, and includes a short discussion of "Firthite" and Firthaloy" sintered carbides. (148)

Cleaning Materials for Metal Working Plants

A 43-page booklet prepared by E. F. Houghton & Company discusses their Houghto-Clean metal cleaners, giving detailed directions for cleaning in tanks, cleaning and copper plating in one solution, cleaning before galvanizing, tinning, painting, etc., as well as a description of the whole cleaning operation as carried out in power plants, railroad yards and the oil industry. Several varieties of these cleaners are especially adapted to the rapid and economical removal of cutting oils, quenching oils, etc. (149)

High Temperature Cement

In many forms of fire brick construction, the use of a suitable high temperature cement will materially lengthen fire brick life, and in order to aid the user of refractories in his selection of the cement best suited to his conditions the General Refractories has prepared a 20-page booklet. The results of a series of tests run on their Grefco cements are given. (150)

Cement Lined Pipe

A circular received from the National Tube Company describes their Duroline pipe, a steel pipe combined with a special lining material for resistance to corrosive waters and corrosive solutions. The lining is not affected by rapid temperatures or by long exposure to temperatures up to 210° F. Its low thermal conductivity provides heat insulation, also. (151)

Type Metal

Two little leaflets from the Merchant & Evans Company will be of interest to those who purchase type metal. One discusses their type metal, and the necessity for being sure of the analysis of that which one buys and the other booklet tells about their Restore-Metal for keeping used type metal uniformly to the correct formula. (152)

Zinc Coated Wire

Folder 283 from the Bethlehem Steel Company describes their Bethanized wire, a wire with a zinc coating so tight and ductile that the wire can be bent around its diameter, or even flat on itself, without damage to the coating. Bethanizing also makes possible coatings twice or even three times as heavy as the maximum that can be applied by older processes. (153)

Heat Resisting Alloys

The Allegheny Steel Company has prepared a folder, Bulletin S-44, which gives the chemical composition, and physical properties of their Allegheny 44, an alloy suitable for many applications demanding maximum heat resistance as well as facility of fabrication. (154)

Nickel Manganese Steel Welding Rod

A recent circular from the American Manganese Steel Company gives suggestions for welding with their nickel manganese steel welding rod and shows illustrations of its application in the reclamation, by building up to compensate for previous wear, of manganese steel castings and in repair of fractured parts of the same steel. (155)

Electric Furnaces

Catalog No. 22 of the Ajax Metal Company in addition to giving descriptions and specifications of numerous installations of their electric furnaces, tells the principle on which the furnaces work, gives the melting efficiency on various metals, and the advantages in their use, such as temperature control, automatic circulation of metal bath and reduction of metal loss. (156)

Corrosion Prevention

"Ne-Ver-Rust" is a thin transparent liquid composed of mineral greases dissolved with spirits of turpentine. It will cover between 1500 and 2000 square feet per gallon on polished surfaces and may be used as a dip or applied with a brush. A leaflet describing it may be obtained from the Never Rust Manufacturing Company. (157)

Spectroscopes and Spectrographs

A very complete and detailed description of their spectroscopes and spectrographs is given in a booklet distributed by Carl Zeiss, Inc. Among the types included are a small spectrograph for the visible spectrum, hand spectroscopes and comparison spectroscopes. (158)

Galvanizing Furnaces

A recent circular from the Surface Combustion Corporation describes an installation of their diffusion combustion galvanizing furnace giving operating data. (159)

Bronze Welding

A booklet descriptive of their No. 25 M. bronze welding rod for bronze welding steel, brass, cast iron, copper, nickel and Monel metal has been received from the Linde Air Products Company. The booklet contains several pages on the technique of using this welding rod. (160)

Transmission of Heat in Industrial Furnaces

Reprints of an 8-page article with the above title are being distributed by the Electric Furnace Company. (161)

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Grinding, Polishing, Buffing Monel Metal and Pure Nickel

A very complete discussion of the finishing of Monel metal and pure nickel may be found in Bulletin TS-5 of the International Nickel Company. Specific examples of giving various finishes to different types of materials are included. (162)

Zinc Die Castings

The latest issue of The Alloy Pot, distributed by the New Jersey Zinc Company contains an article on "The Design of Die Castings" and a table showing the effect of two years of normal aging on the properties of die cast Zamak alloys. (163)

Electrotinning

Full directions for electrotinning with the R & H sodium stannate-acetate bath are given in a pamphlet prepared by the Roessler & Hasslacher Chemical Company. This alkaline bath is said to be superior to acid baths, giving smoother and brighter deposits and being easily controlled to give good color of deposits and bath composition. (164)

Independent Research Organization

Catalog No. 1 from the Ferrous Magnetic Corporation gives an outline of the purpose of the company, which is to do independent research of its own, improving new magnetic inspection methods and equipment for inspecting steel in the billet and to solve problems presented to them by steel companies. (165)

Electric Furnaces

A recent bulletin from the Pittsburgh Lectromelt Furnace Corporation is devoted to their special furnaces for the production of ferro-alloys, calcium carbide, for distillation, annealing, ore smelting, etc. The pamphlet also includes a discussion of standard arc melting and refining furnaces for iron and steel production in sizes to 50 tons capacity. (166)

Hard Facing Excavating Equipment

Increased life and savings effected through the application of hard-facing materials to the wearing parts of excavating and dredging equipment are described in a 16-page booklet issued by the Haynes Stellite Company. Several types of hard-facing materials are discussed including the non-ferrous Co-Cr-W alloys and welding rods consisting of particles of crushed tungsten carbide bonded together with steel. Such information as recommended welding processes, thickness of deposits, metals that can be hard-faced, etc., is listed in a table. (167)

Wire Cloth

A screen cloth made of Inconel, a new alloy containing approximately 80% pure Ni, 12-14% Cr and about 6% Fe, is discussed in Architects' Reference Bulletin No. A-4 from the International Nickel Company. This wire is silvery white in color and possesses more than sufficient tensile strength for wire fabric. Samples of Inconel screening have been exposed to salt water atmospheres and industrial chemical discharges in several localities since July 1931 and to date show no trace of discoloration, no corrosion and no leaching. (168)

Fatigue Machine

Bulletin No. 1 from the Thompson Grinder Company describes the R. R. Moore Fatigue Machine for determining the resistance of metals to repeated stresses, the effects of various factors on the life of metals and causes of service failures. (169)

Furnaces

Several new furnaces installed by the Electric Furnace Company are illustrated in a leaflet sent out by the company. Among the types shown are a circular pit type electric furnace, gas fired rotary hearth type sheet normalizing furnace and an oil fired continuous pusher type billet heating furnace. (170)

Pyrometers

The Leeds & Northrup Company has issued a catalog describing and illustrating their optical pyrometers devoting one section to the application of these instruments. (171)

Electric Furnaces

Continuous electric furnaces for heat treating ferrous and non-ferrous strip metal and wire are discussed in Bulletin 280 from H. O. Swoboda, Inc. A feature of the catalog is a cross section diagram of a complete installation of hardening and tempering equipment. (172)

Cadmium Plating

Udylite-Cadmium plating is used on the parts of aeroplanes, trucks and windmills according to articles in the June issue of Udylite News published by the Udylite Process Company. It is also used on oil cans for use on farms, thus insuring protection against exposure to the weather. (173)

Tractor Welder

A tractor welder designed exclusively for railroad track, bridge and structure maintenance is illustrated in a folder from the Westinghouse Electric & Mfg. Company. A cross section sketch of the welder shows its construction. Its various applications in railroad work are illustrated. (174)

Wrought Iron

A booklet received from A. M. Byers Company is entitled "An Important Contribution to Metallurgy" and it describes their new mechanical process for making wrought iron as compared with the old hand puddling process. Numerous illustrations add to the interest of the booklet. (175)

Flexible Coupling

The Link-Belt Company announces their "RC" Flexible Coupling which consists of two cut-tooth sprocket wheels (or coupling halves) and a piece of roller chain to connect them, all working surfaces being machined to close tolerances. A pin-and-cotter link makes it easy to couple or remove the chain when desired. (176)

Heat Treatment of Steels

General information on case-hardening and heat treating of steels is given in a booklet issued by the Roessler & Hasslacher Chemical Company. It includes a discussion of the application and operation of molten cyanide baths for the low temperature nitriding of special alloy steels. (177)

Pyrometers

A leaflet from the Mishawaka Industrial Instrument Manufacturing Laboratory describes their indicating thermoelectric type pyrometers, giving illustrations and prices. (178)

A Small Cupola

In the latest issue of The Whiting Founder there is a description of their portable "No. 0" cupola which melts one ton an hour. In the same issue there is a short discussion of the Moore Hot-Blast Cupola. (179)

METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

I should like a copy of each piece of Manufacturers' Literature listed below.

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Name.....

Position..... Firm.....

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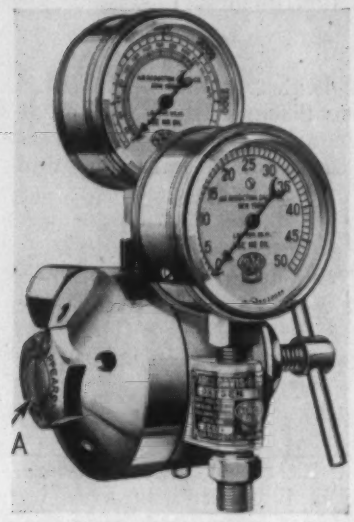
City..... State.....

NEW MATERIALS and EQUIPMENT

Double Reduction Pressure Regulator

In welding and cutting work and other work requiring utilization at low pressures of gases supplied in high pressure cylinders, it is desirable to maintain a constant delivery pressure at the torch or other device while the cylinder pressure drops gradually from an initial value of 2,000 lbs./in.^{2} to less than 100 lbs./in.^{2} The Air Reduction Co. announces the development of a radically new type of regulator which is said to fulfil this requirement not only under laboratory conditions but in cold weather and under severe service conditions. Investigations of regulation characteristics have brought out that, in the typical case of maintaining 10-lb. delivery pressure, the curve of the new device's regulation characteristic (cylinder pressure plotted against delivery pressure) is perfectly flat from 2,000 lbs./in.^{2} cylinder pressure down to less than 75 lbs./in.^{2} whereas all single-stage regulators—unless readjusted frequently—drop the delivery pressure considerably while the cylinder pressure drops. Even double-stage regulators of the types heretofore available show serious variations of delivery pressure when the cylinder pressure falls below 300 lbs./in.^{2} and in some cases at 600 lbs./in.^{2} With the new Airco regulator, a slight departure from the straight line appears at around 60 lbs./in.^{2} but it amounts to less than 2% of the delivery pressure; and only below 20 or in some cases 18 lbs./in.^{2} cylinder pressure does the delivery pressure drop sharply down from the 10-lb. ordinate. The maximum departure from 10-lb. delivery pressure generally occurs between 30 and 40 lbs./in.^{2} cylinder pressure and its magnitude seldom exceeds 0.2 lb./in.^{2}



In addition to desirable pressure-control characteristic, the new Airco regulator has been designed with a warning signal in the form of a red button which projects (at "A" in figure) in the event of excessive pressure building up in the intermediate pressure chamber by reason of foreign material on high-pressure seat or other accidental occurrence. If the operator ignores this signal a relief valve, provided for the purpose, will function and prevent diaphragm rupture but the red button will remain displayed to signal that repairs should be undertaken as soon as practicable.

Metals & Alloys, July 1933

Potentiometer E. m. f. Source

A new type of battery has been developed which enables the Brown Instrument Co.'s potentiometer pyrometer to operate one month or longer without standardizing. The Brown Compensated Air Cell is a wet type non-rechargeable battery, shipped dry and rendered active by adding cool drinking water. It derives its name from the principle of air polarization, the oxygen being obtained from the air rather than from compounds within the battery. It is equipped with a built-in coil which automatically compensates for changes in the temperature surrounding the battery. The action of the compensator is continuous, so there is no possibility of errors occurring between periods of standardizing, the large ampere-hour capacity insuring a constant current output over long periods of time. The life of the cell is over 2½ years. Its low upkeep eliminates the cumulative cost of replacing dry cells. It can be used with all types of Brown Potentiometers.

Metals & Alloys, July 1933

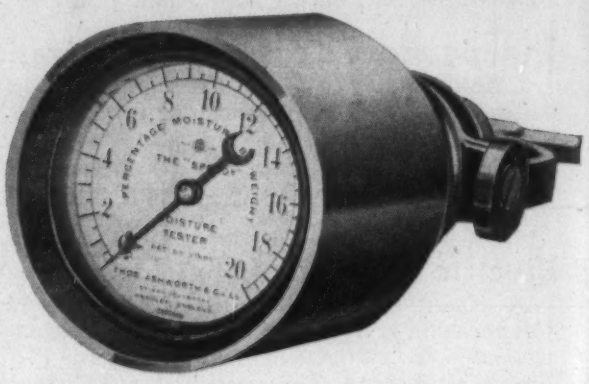
Beryllium Copper Springs in New Switch

The unusual mechanical and electrical properties of beryllium copper have made possible the commercial production of a snap-action electric switch which, in spite of its high rating of 10 amps. at 110 volts a.c., operates on 0.0004 inch-ounce of energy—a small fraction of the energy required to contact an ordinary bell push-button. This use of beryllium copper is new but investigations showed its superiority. Jackson Burgess, of the C. F. Burgess Laboratories, makers of the new switch, states: "The electrical conductivity of beryllium copper is high, and in addition, unusually heavy currents can be passed through it without having the heat thus produced upset the desired physical characteristics. The physical properties are similar to spring steel and are far superior to those of all other current-carrying spring materials. Representative of the value of beryllium copper springs are the tests made in comparison with phosphor bronze, wherein both metals were subjected to continuous flexing at a rate of 10 load-cycles per second. All phosphor bronze samples failed in less than 800,000 cycles; whereas the beryllium copper samples withstood 15,000,000 cycles without signs of deterioration."

Metals & Alloys, July 1933

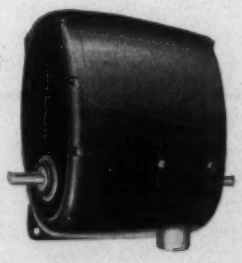
Moisture Tester for Sand, Coal, etc.

Rapid determinations of moisture content in nearly all granular and fibrous materials are made possible by means of a simple, rugged absorption apparatus styled the Speedy Moisture Tester, recently introduced by The Alpha-Lux Co., Inc. A definite weight of the material to be tested is poured into a container that resembles a cocktail-shaker. A measure of absorbent powder (furnished with tester) is poured into the cap; the cap is put on and clamped while the apparatus is held horizontally to prevent mixing; the whole is shaken to mix material and absorbent thoroughly, and the gage is read. The dial reads directly in weight-percentage of moisture. For the most exact determinations, pause a short time, shake, read gage again, and if successive readings agree, the accuracy is claimed to be comparable to that of laboratory methods. The Speedy Moisture Tester is put up in a handled case which weighs 13 lbs. and may therefore be carried around the foundry or shop.



Metals & Alloys, July 1933

Temperature Control Motors



These power units, inherently electric motor driven speed reducers in that each incorporates a motor element and reduction spur gear trains, may be used in conjunction with controlling pyrometers, etc., and are available for operation in accordance with the following modes of automatic control: 1. Two-position (*a.* On-and-Off, *b.* High-Low); 2. Three-position; 3. Floating; 4. Proportioning. On account of their ability to damper regulation and the ease with which their electrical circuit can be interconnected with their motorized fuel-air valves, the Minneapolis-Honeywell Regulator Co. can supply equipment which serves not only to regulate furnace temperature but also to adjust atmosphere. Among other uses is the direct drive of double seated regulating valves of the sliding and rotary shaft stem classifications in a wide range of sizes in conjunction with automatic controllers or remote station switches. Together with the gear train and switching mechanism, the motors are assembled in a totally enclosed, dust- and splash-proof housing. Cut high-strength aluminum gears and steel pinions are packed in sufficient grease to last indefinitely. Shaft extensions are slotted for No. 2 Woodruff keys. Electrical connections are made through the ½" conduit entrance in the housing.

Metals & Alloys, July 1933

Steel Beer Kegs

Metals & Alloys, July 1933

The A. O. Smith Corp., Milwaukee, has introduced a steel barrel to sell at a price competitive with that of the wood variety and is preparing to produce it on a large scale basis. The Smith package, in half-barrel size, is made of medium high carbon steel, is of all welded construction and weighs about 60 lbs. as against 70 to 72 lbs. for a wood half-barrel. It is lined with a coating that adheres readily to steel and does not impart taste, odor or color to beer. The half barrel is 23"x 17½". The usual wood bung is employed. Based on an estimate of the brewing industry's keg requirements of 12,000,000 units, it is possible that more than 350,000 tons of steel would be required.

GENERAL (0)

The Metals, their Alloys, Amalgams and Compounds. A. Frederick Collins. D. Appleton, New York, 1932. Cloth, 5¼x7¾ inches, 310 pages. Price $2.00. This is one of those books that is supposed to sugar-coat technical information so it can be readily swallowed by the general public. Much space is given to telling how the metals got their names, and to the chemical composition of the ores of the various metals. The sugar-coating is provided by sentences of the type of the following: "Iron and mercury are barely on speaking terms and it is therefore difficult to make an amalgam of them, but it doesn't much matter because it would be of but very little use." Eye appeal is supposed to be provided by crude wood cuts of things ranging from a monkey wrench to a diagram of a Bessemer converter. The idea of putting technical information into assimilable form is praiseworthy. Its successful accomplishment is much rarer than the attempt. Trying to do this is the author's business, as he has published some 60 books of the type, including the Book of Puzzles, the Amateur Entertainer, the Book of Magic, the Book of Stars, and volumes on experimental mechanics, chemistry, optics and what not, to say nothing of "Aviation and all about it." The publisher's statement says he is an electrical physicist, a Fellow of the Royal Astronomical Society, and has conducted investigations of spiritism. First-hand knowledge of metallurgy is quite evidently lacking among his attainments. He says that on heating to 900° C. alpha ferrite recrystallizes and becomes beta ferrite. A Babbitt metal formula given is 67 Cu, 19 Sn, 7 Zn, 3 Sb, 4 As. In a list of ferro-alloys, ferro tungsten is given as ferro-tungstate. Tungsten bronze, 90 Cu, 10 W is said to have properties similar to manganese bronze. There are some merely sloppy errors. Following the comment "After copper is drawn into wire, it is more tenacious but less conductive," we are told to "see Figure 6." Figure 6 is of a copper down-spout. A diagram of a rather unusual furnace for roasting zinc ore is illustrated and the caption says it is a furnace for reduction of zinc ore. The book contains second-hand, copied statements and while in the main the statements made are true and clear, —though in many cases not very important to anybody,—there are enough glaring errors so that the metallurgist cannot rely on the book for accuracy. The chemistry is more nearly accurate than the metallurgy. The one novel and interesting chapter is on the "hypothetical metals," i.e., metals alleged to have been discovered by various workers but not later substantiated as elements. These run from Junoium, 1811 to Welsium, 1920. A high school student of chemistry might find the book of interest. Few metallurgists will. H. W. Gillett (0)-**B**-

Metallurgie. Agenda Dunod 1933. R. Cazaud. Dunod, Paris, 1933. Cloth, 4x6 inches, 354 pages. Price 20 Fr. The *Metallurgy* of Agenda Dunod Series apparently has passed the stage of a mere book and has become an institution. Every year its little volume sees the light and is duly consumed by the French public. For what purpose, however, still remains a mystery. It is not a handbook because no subject is dealt with comprehensively enough to furnish any help to a specialist. Nobody can accuse the work of being a purely statistical tabulation. An encyclopedia might do, provided 354 pages measuring 4 by 6 inches can embrace both ferrous and non-ferrous metallurgy and all the related arts. One must grant that the little information available is given well, clearly, briefly and to the point. At the same time the reader is seriously informed that a Bessemer blow takes one half hour, metallographic specimens are finished on the lap rotating at 3000 r.p.m., 28.5% of all Pt produced in the world is consumed for false teeth, melting point of soft Fe is 1520° C., etc. A general impression is created that the book is patterned along the lines found in handbooks of some societies,—a house organ written by good fellows for their friends who are not too particular about a few facts or figures. Much would be gained if the yearly edition of this book could be replaced by one which does not appear so often but is of a better class. When the vital statistics, even if for France alone, are brought up to date, technical and scientific data properly checked and the scope of information extended above the requirements of the primary grade the publication might become of interest for the metallurgical world at large. John D. Gat (0)-**B**-

General Metallurgy. G. M. Enos & R. O. McDuffie. Published by the authors, Cincinnati, 1932. Paper, photo-lithographed, 8¾x10¾ inches, 314 pages. Price $3.00. This is one-year course for college students, introducing them to physical metallurgy, with brief comment on ore dressing and an outline of the reduction of Fe ore. Part I deals in considerable detail with pyrometry and in a general way with furnaces, fuels and refractories. Part II discusses the tools of metallography, especially the microscope. X-ray methods and crystal structure are discussed briefly but clearly. Plastic deformation and annealing comes next, then equilibrium diagrams are thoroughly dealt with, as types rather than in respect to a particular system. Physical and mechanical properties are discussed with general comments but not much detail on testing methods. A chapter is devoted to corrosion. The effort is to deal with principles rather than to set forth a lot of specific facts to be memorized. This section relates to both ferrous and non-ferrous alloys. Part III is entirely devoted to Fe and steel, manufacture and fabrication, heat-treatment and uses. Cast Fe is specially treated but malleable is not discussed in any detail. Alloy steels are very briefly treated, no attempt being made to cover them exhaustively, hence, such things as the gamma loop are not mentioned. Non-ferrous alloys are not given much attention, save for the general principles brought out in Part II. Precipitation hardening is not dealt with, though it would seem to deserve a place in such a course. This, and a section on non-ferrous alloys, will be added when the book is finally issued in printed form. Each teacher of metallurgy has his own ideas of what is most fundamental and most necessary for his students to become thoroughly grounded in. Hence, each teacher is likely sooner or later to write up his lectures into text book form. All such text books have many points of similarity, but differ in emphasis and balance. The object of this one, to emphasize general principles, is well attained. It should give the student a good foundation and could well be used by other universities. H. W. Gillett (0)-**B**-

Elementary Metallurgy for Engineers. G. F. C. Gordon. Constable & Co., Ltd., London, 1932. Cloth 5¼ x 8¼ inches, 156 pages. Price 8s. 6d. The author is superintendent of the engineering workshops at Cambridge. The volume represents the elementary metallurgical information he believes every engineer should have, written pretty much in shop language. The production of pig iron, cast iron, wrought iron, structural steel, tool steel and forgings is briefly discussed, with an eye to defects that may affect subsequent performance. Heat-treatment and thermal effects are dealt with, with the emphasis on the bad effects of faulty treatment. Alloy steels and non-ferrous alloys are mentioned in very condensed fashion. It is not an easy task to deal with metallurgy in simple language, and the student of this book will have a long way to go before he would become an expert metallurgist. Yet the young engineer, even though he may not grasp completely some of the metallurgy in the volume because of the highly condensed way it is presented, should at least gain many of the fundamentals, and know a good many things to watch out for in engineering practice. The comments on inspection and testing and on selection of materials, though brief, are well to the point. No completely satisfactory book of this type has ever been written, and probably cannot be. This one is above the average, and should serve its purpose quite well. H. W. Gillett (0)-**B**-

The Journal of the Institute of Metals. Volume XLIX, No. 2. Edited by G. Shaw Scott. Institute of Metals, London, 1932. Cloth, 5½x8½ inches, 416 pages. Price 31s. 6d. This volume contains the minutes of the Annual Autumn Meeting of the Institute of Metals, held in September, 1932, in London, and the papers read at the meeting with the discussion. The papers have been abstracted separately in *Metals & Alloys*. M. L. Moorman (0)-**B**-

PROPERTIES OF METALS (1)

The Magnetic Susceptibilities of Alpha- and Beta-Manganese. Mary A. Wheeler. *Physical Review*, Vol. 41, Aug. 1932, pages 331-336. Pure α-Mn was prepared by distillation. β-Mn was prepared by melting a sample of the α-Mn in vacuum, and quenching it in water from about 1000° C. The mass susceptibilities of these two specimens were measured by a null-reading, astatic magnetometer, and found to be 9.60 $(10)^{-6}$ and 8.80 $(10)^{-6}$ respectively. These results eliminate the possibility that the ferro-magnetic Mn found by some investigators is either the α- or the β-crystal form. WAT (1)

Color of Silver as a Function of Its Surface Condition. (Die Farbe des Silbers als Funktion seiner Oberflächenbeschaffenheit.) A. Kutzelnigg. *Kolloid Zeitschrift*, Vol. 61, Nov. 1932, pages 48-50. According to manner of production and treatment Ag can appear in varying colors; corresponding to law of dispersion surface colors can be arranged in a continuous series between black and white. 17 references. Ha (1)

Aluminum as a Reflector of Ultraviolet Radiation. M. Luckiesh. *Electrical World*, Vol. 100, Aug. 13, 1932, page 206. Oxidized Al is an efficient reflector of ultraviolet radiation. The Al is etched by immersion in a solution containing 5% NaOH, 4% NaF and 91% H_2O, at 90°. The piece is then washed in warm H_2O, immersed 30-40 sec. in 1:1 HNO_3 to remove black film, washed in H_2O, and wiped with cotton cloth. CBJ (1)

Hall Effect and Superconductivity. I. Kikoin & Boris Lasarew. *Nature*, Vol. 129, Jan. 9, 1932, pages 57-58. From a comparative study of metals and metallic sulphides it is concluded that superconductors commonly have small values of the Hall coefficient. Ha (1)

Contribution to the Theory of the Electric Resistance and the Supraconductivity of Metals. (Beitrag zur Theorie des elektrischen Widerstandes und der Supraleitfähigkeit der Metalle.) E. Kretschmann. *Annalen der Physik*, Series 5, Vol. 13, May 1932, pages 564-598. Theoretical investigation of dependence of electric resistance and supra-conductivity of pure, macroscopically isotropic, solid metals from temperature, magnetic field and pressure. Newer theories are reviewed and their defects in explaining various relations uniformly pointed out. Discontinuity in resistance curve in proximity of absolute zero is especially considered and explanation attempted by density of free electrons. Heat conductivity can be explained by exchange of energy between free electrons and atoms, but relation to electrical resistance is not yet quite clear. Ha (1)

Diamagnetic Susceptibilities of Inorganic Compounds. Part III. Cu^+, Ag^+, Au^+, Zn^{++}, Cd^{++}, Hg^{++} and Hg_2^{++} Ions. Kiyoshi Kido. *Science Reports Tohoku Imperial University*, Vol. 21, July 1932, pages 288-297. Susceptibility of a molecule is calculated according to Langevins theory of diamagnetism and method described with which ionic susceptibilities were measured; values obtained for latter are tabulated and an equation derived giving relation between ionic susceptibility and number of electrons in ions. Ha (1)

Heat Capacity of Iron. A Review. J. B. Austin. *Industrial & Engineering Chemistry*, Vol. 24, Nov. 1932, pages 1225-1235. With a few minor exceptions, such as the values for γ Fe between — 100° and + 100° C., the heat capacities of both forms of Fe are known with reasonable accuracy from 20° K. to 900° C. Above this latter temperature the data are not satisfactory. 25 references. MEH (1)

The unusual metal or alloy of today may be the usual metal of tomorrow.

You will profit by looking over this section as well as the sections on non-ferrous and ferrous alloys.

The Effect of Adsorbed Gases on the Photoelectric Emissivity of Iron and Platinum. A. Keith Brewer. *Journal American Chemical Society*, Vol. 54, May 1932, pages 1888-1900. An investigation of the photoelectric properties of Fe and Pt in the presence of various gases shows that the metals do not exhibit the characteristic properties of a pure metal as is found under good vacuum conditions, but rather possess the properties of composite surfaces. MEH (1)

Some Thermo- and Galvanomagnetic Properties of a Bismuth Crystal. H. E. Banta. *Physical Review*, Vol. 41, July 1932, pages 239-250. Fractional changes, due to a magnetic field, in electrical conductivity, in thermal conductivity, and in thermoelectric power of a Bi single crystal are measured. These changes are determined as a function of field strength, of direction of the field, of direction of crystal axis, and of direction of heat and electric currents through crystal. An electric current sent through crystal cools one junction and heats other by Peltier effect. Temperature difference thus produced gives rise to a thermal e.m.f. in crystal circuit. Observations of this e.m.f. allow calculation of fractional changes produced in thermal conductivity and in thermoelectric power. Change of electrical conductivity is influenced much more strongly by crystal structure than is change of thermal conductivity. Crystal structure and orientation of magnetic field both affect strongly the change in thermoelectric power. Theory of electrons in metals in its present form does not give an adequate explanation of results. If magnetic field changes free electron density in Bi some of the results may be explained in a general way. WAT (1)

Temperature Coefficient of Electrical Resistance of Silicon, and a Thermoelectric Effect of Unipolar Substances (Sur le coefficient de température de résistivité électrique du silicium et un phénomène thermo-électrique des substances unipolaires). Ch. Bedel. *Comptes Rendus*, Vol. 195, Nov. 14, 1932, pages 871-873. With Si, galena, pyrites and carborundum, differences of potential of the order of a few millivolts are developed when the substance, forming part of a conducting circuit, is heated. In case of Si, this effect cannot be ascribed to induction, chemical action, temperature gradients or pressure effects. Phenomenon is explained as due to Seebeck effect and to rectifying properties of unipolar substances. This thermoelectric effect was observed in course of work on temperature coefficient of resistance of fused Si. Exact measurements of this coefficient were found to be impossible because of thermoelectric effect. However, qualitative variation of temperature coefficient could be followed. With pure Si coefficient is negative. OWE (1)

The Atomic Weights of Selenium and Tellurium. (Die Atomgewichte von Selen und Tellur.) O. Hönigschmid. *Die Naturwissenschaften*, Vol. 20, Aug. 26, 1932, page 659. The value recently determined by Aston greatly differed from the internationally accepted atomic weight and challenged redetermination. The author found the same value as Aston for Se: 78.962 ± 0.002. In case of Te the internationally adopted value of 127.587 ± 0.019 was corroborated. Recent spectroscopic determinations of Bainbridge discovered the presence of some isotopes which slipped Aston's notice. Redetermination led to the following value: 127.58 ± 0.15. EF (1)

The Effect of Ammonia on the Positive Ion Emissivity of Iron, Nickel and Platinum. A. Keith Brewer. *Journal American Chemical Society*, Vol. 54, Dec. 1932, pages 4588-4597. Results are given showing the effect of N, H and ammonia on the thermionic emission of positive ions from Fe, Ni and Pt. MEH (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

Illium Alloys—Their Physical and Chemical Properties. *Canadian Chemistry & Metallurgy*, Vol. 16, Nov. 1932, page 282. Complex Ni-Cr alloys based on the Ni-Cr-Cu ternary with traces of other elements consisting of Mo, W, Fe, Mn, and Si are discussed. These alloys are neither too soft nor too hard. Physical properties are: sp.gr. 8.3, wt./in.^{3} 0.3 lb., sp.heat 0.105 cal./°C., coefficient of expansion/°C. (between 20-300°) 0.0000135, electrical resistance 121.9 michrohms/cm., contraction in casting 5/16"/ft., machinability slightly harder than cast steel, tensile strength 60000 lbs./in.^{2}, elastic limit 50000, hardness Brinell 170-200, melting point 1300° C. WHB (2)

The Properties of Tin and Silicon in Copper-Nickel Alloys for Steam Valves. (Les propriétés des cupronickels a l'étain et au silicium employés pour obturateurs à vapeur.) LEON GUILLET, AUGUSTE LE THOMAS & MARCEL BALLAY. *Comptes Rendus*, Vol. 194, June 13, 1932, pages 2102-2105. The composition and properties of alloys suitable for use in steam valves are summarized. The influence of the presence of impurities in the usual Cu-Ni-Sn alloys is discussed and the effect of Si found to be very important. The hardness of alloys of the series Cu-Ni-Si is measured; it increases rapidly with the Si content, although photomicrographs reveal no new constituent over the range of composition investigated. The study shows that desirable qualities are obtained by adding appropriate amounts of Sn and Si to Cu-Ni alloys. For high-pressure machines 2 types are suggested: Ni 50%, Cu 39%, Sn 8%, Si 3%; and Ni 65%, Cu 27.5%, Sn 4%, Si 3.5%. Their Brinell number is about 350 at 20° C. and 315-320 at 450° C. They have the same structures as ordinary bronzes with 15% Sn. OWE (2)

Amalgam—Its Practical Application as a Filling Material and Some of Its Properties Brought out by Recent Research Work. JOHN T. HANKS. *Journal American Dental Association*, Vol. 19, Oct. 1932, pages 1725-1727. Brief general résumé of the development of amalgams and emphasis on the importance of proper technic in the use of amalgams in dentistry. OHE (2)

Effect of Variations in Manipulation of Dimensional Changes, Crushing Strength, and Flow of Amalgams. MARCUS L. WARD & ERMAN O. SCOTT. *Journal American Dental Association*, Vol. 19, Oct. 1932, pages 1683-1705. Dimensional changes were determined by an optical micrometer and by interferometers. It was found necessary to standardize such conditions as surface of mortar and pestle, rate of rotation in mixing, pressure and time, in order to secure consistent results. A sand-blasted mortar and pestle gave different results than glazed ones. Special packing instruments were designed to give uniform and higher pressures. Following conclusions were drawn regarding effect of packing pressure, using "normal mixing" on dimensional changes of amalgams. (1) Expansion increases with packing pressure up to 16,000 lbs./in.^{2} (2) At about 32,000 lbs./in.^{2} there is further expansion, and there is an upward turn in expansion-packing pressure curve between 64,000 and 128,000 lbs./in.^{2} The formation of compound Ag_2Hg_4 is thought to be responsible for increase in expansion with packing pressures above 16,000 lbs./in.^{2} (3) Dimensional changes progressed beyond 24 hours. (4) The % Hg in amalgams decreased with increase in packing pressure but could not be reduced below 28.3%, and highest packing pressure produced an amalgam with a crushing strength of 73,000 lbs./in.^{2} With the 5 high-Ag alloys studied undermixing (about 25 sec. in mortar and 15 sec. in hand) showed maximum expansion, while overmixing (3 min. or more) generally showed a contraction. Overmixing generally increased crushing strength, but in most cases increased percentage of flow under pressure. Authors point out some inconsistencies between claims of manufacturers and Federal Tentative Specification No. 356 for amalgam alloy. 9 references. OEH (2)

Fatigue of Copper. Correspondence R. L. TEMPLIN. *Metals & Alloys*, Vol. 3, Nov. 1932, page 262. Referring to previous article (*Metals & Alloys*, Vol. 3, Sept. 1932, pages 200-204) writer discusses briefly annealing of Cu tubing with respect to its fatigue resistance and presents conclusions of his tests to date. WLC (2)

Copper-Nickel Alloys. (Les Cupro-Nickels speciaux.) MARCEL BALLAY. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, June 1932, pages 203-208. Abstract of paper, Foundry Convention, Milan 1931. Alloys containing Ni are very sensitive to S attack which forms Ni_3S_2 and its eutectic, which melts at 630° C., renders metal brittle. Mg neutralizes effect of S, acts as a deoxidizer and eliminates gases. 45% Ni alloy, known as silveroid, has tensile strength of 30-35 kg./mm.^{2}, 1-15% elongation and 70-75 Brinell hardness. Solubility of Si in Cu-Ni alloy varies with temperature; alloys are then very sensitive to heat treatment. A typical Si-Cu-Ni alloy contains 64.6% Ni, 27.5% Cu. 3.7% Fe, 1.2% Mn and 2.8% Si. A 6% Si addition increases Brinell hardness of a Cu-Ni alloy about 400%. Addition of 10% Sn reveals on microscopic examination a white constituent which appears to be similar to the structure of Sn bronzes, the white constituent of δ bronze. Si reduces the solid solubility of the hard constituent in the Cu-Ni alloys containing Sn. FR + GTM (2)

Non-Ferrous Metals and Alloys. Report of A.S.T.M. Committee B-2, WM. CAMPBELL, Chairman. *Preprint* No. 19, June 1932, *American Society for Testing Materials*, 3 pages. Revisions of specifications for Fire-Refined Copper Other than Lake. Progress reports of subcommittees. VVK (2)

Copper Wire. Report of A.S.T.M. Committee B-1, J. A. CAPP, Chairman. *Preprint* No. 18, June 1932, *American Society for Testing Materials*, 9 pages. Proposed tentative specifications for hard-drawn Cu transmission cable. Revisions of specifications for Cu and bronze trolley wire. VVK (2)

Structure of Nickel-Zinc Alloys I. (Der Gefügeaufbau der Nickel-Zink-Legierungen I.) W. HEIKE, J. SCHRAMM & O. VAUPEL. *Metallwirtschaft*, Vol. 11, Sept. 23, 1932, pages 525-530; Sept. 30, 1932, pages 539-542. Alloys of Ni and Zn were melted in quartz or porcelain tubes which were sealed at neck after being filled with charge and evacuated. Alloys were held for 5 to 20 min. above their melting point to obtain solution of Ni and uniform composition. They were then cooled to 950° C., held for one week, and cooled very slowly to room temperature. X-ray examination of alloys revealed 5 different phases at room temperature: 1. α, including solid solution of Ni and Zn, containing 100 to 70% Ni. Face centered cubic with parameter increasing from 3.520 A.U. to 3.588 A.U. 2. β_1, containing 54 to 45% Ni, solid solution phase of compound NiZn. 3. γ, 25 to 15% Ni, solid solution phase of compound $NiZn_3$. 4. ϵ, approximately 10% Ni, solid solution phase of compound Ni_2Zn_{15}. 5. Close packed hexagonal Zn lattice containing only traces of Ni. 47% Ni alloy corresponding to Ni Zn has a tetragonal lattice with parameters a = 2.754 A.U., c = 3.214 A.U. and a density of 8.40. At 890° C. it was found that Ni Zn has a cubic lattice with a = 4.112 A.U. Transformation temperature is about 750° C. It was impossible to obtain cubic modification at room temperature by quenching. Results of thermal analysis of 100% to 44% Ni alloys are shown in diagrams. Line G-H-B at 1040° could be determined exactly. Line L-M at approximately 810° C. corresponding to transformation of cubic β to tetragonal β_1, was difficult to determine on account of hysteresis up to 50° C. during cooling and heating. Constitutional diagram was confirmed by microscopic examination of samples homogenized and cooled slowly, and homogenized and quenched from salt baths into salt water. 27 photomicrographs show structure of the 100% to 44% Ni alloys. 11 references. CEM (2)

Resistance Material. (Widerstandmaterial). GEO. KEINATH. *Archiv für Technisches Messen*, Vol. 2, July 1932, section Z931-1, pages T110-111. Principal requirements for a material to be used as resistance material especially in measuring instruments are explained and the chemical composition and physical constants of manganin, constantan, and Ni-Cr described. A nomogram is given for the determination of the ohm/m. from specific resistance and diameter. Ha (2)

PROPERTIES OF FERROUS ALLOYS (3)

Yield Point Included in New Swedish Specifications. Correspondence from EINAR OEHMAN. *Metal Progress*, Vol. 22, July, 1932, page 59. A minimum lower yield point of 31,500 lbs. for 60,000 lb. structural steel and of 37,000 lbs. for 70,000 lb. steel was included in recent specifications of Swedish State Railways. Allowable spread was increased from 3 to ±5%. WLC (3)

A Correlation of Some Mechanical and Magnetic Properties of 1.21% Carbon Tool Steel. J. V. EMMONS & R. L. SANFORD. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 380-397. Comprehensive investigation of mechanical and magnetic properties of a simple 1.21% C tool steel showed apparently no fundamental relationship between the 2 properties. Mechanical properties, torsion tests, included ultimate torque, ultimate deformation and plastic deformation. Rockwell hardness determinations were also made. Data obtained from magnetic tests included values of maximum induction, residual induction and current corresponding to coercive force, all taken from a maximum magnetizing current of 3 amperes. A very wide range of heat treatments were used. For certain heat treatments correlation was good. Care must therefore be used in applying magnetic analysis and for material treated similarly magnetic analysis is valuable for showing uniformity of product. VVK (3)

Coöperative Study of Charpy Notched-Bar Impact Tests of 18 Per Cent Chromium, 8 Per Cent Nickel, Stainless Steels. Report of Subcommittee G of the Joint Research Committee on Effect of Temperature on the Properties of Metals. C. L. KINNEY, JR., Chairman. *American Society for Testing Materials, Preprint* 31, June 1932, pages 9-19. Compiled by H. C. T. Han. 2 types of 18-8 Cr-Ni alloys, one containing 0.6% C and the other .085% C were tested by Charpy notched bar impact test for following conditions: as rolled, water quenched from 2100° F., air quenched from 1950° F. and subjected to a subsequent 1000-hour draw at one of following 5 temperatures, namely, 800°, 1000°, 1200°, 1400° and 1600° F. Specimens were distributed to 4 coöperating companies and results, in addition to detailed charts, summarized as follows. Appreciable embrittlement of 18% Cr, 8% Ni steels with C content of .06 and .085% is definitely produced after a 1000-hour draw at temperature range 1000° to 1600° F. as revealed by reduction of impact values in Charpy notched-bar tests. For period of 1000 hours there is a definite range in which maximum embrittlement of these steels occur. Location of critical range depends on initial treatments, as-rolled, or quenched in water or air from 2100° and 1950° F., respectively. Under 1000-hour annealing condition as-rolled materials show relatively greater reduction of impact values at lower temperatures (1000° to 1300° F.) than do water-quenched or air-quenched ones. There is practically no difference in the impact value between .06% C and the .085% C steels before and after 1000-hour treatment through temperature range of 800° to 1600° F. Actual value at critical temperature range is about same for specimens with different initial treatments. That is to say, that, even though as-rolled steel has a lower initial impact value than have quenched specimens, percentage of embrittlement in former case is accordingly less than in latter cases. A brief anneal at 1600° F. followed by air cooling of specimens which had been annealed for a long time in temperature range 800° to 1600° F. definitely recovers fully or partially their original impact strengths. Extent of this recovery depends on initial treatments and temperature of long-time treatment. In other words, as-rolled material shows complete recovery while water-quenched or air-quenched material shows full recovery at lower temperature and partial recovery in higher range. Under above conditions of treatment, .06% C steel behaved practically same as .085% C steel. VVK (3)

High-Silicon Pig Iron for Malleable Iron Manufacture. CARL F. JOSEPH & A. L. BOEGEHOLD. *Transactions American Foundrymen's Association*, Vol. 3, Sept.-Oct. 1932, pages 241-265. Certain irregularities in physical properties and appearance of fracture of some malleable cast Fe heats were traced to some unknown qualities in high Si pig Fe. Such differences in pig Fe could not be related to small amounts of Sn, Al, Ti, Cr, Mo, W, Cu, Cd, Co, Pb, Mn, Zn and V. CHL (3)

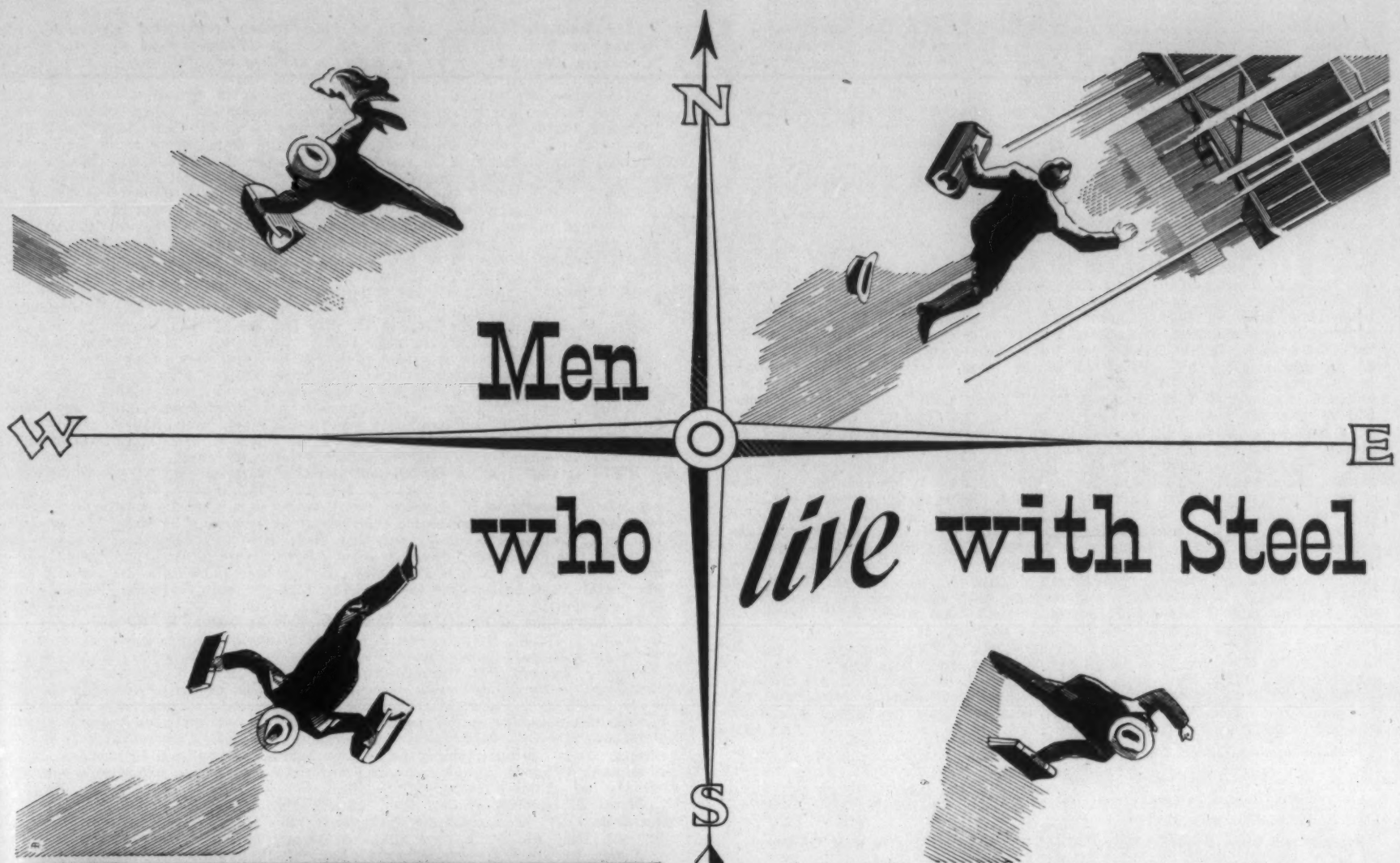
Cast Iron. Report of A.S.T.M. Committee A-3, HYMAN BORNSTEIN, Chairman. *Preprint* No. 11, June 1932, *American Society for Testing Materials*, 17 pages. Proposed Tentative Specifications for Cast-Iron Culvert Pipe, and for Gray-Iron Castings. Progress reports of subcommittees. VVK (3)

Iron-mercury and Nickel-mercury. (Ueber Eisen-Quecksilber und Nickel-Quecksilber.) R. BRILL & WALTER HAAG. *Zeitschrift für Elektrochemie*, Vol. 38, Apr. 1932, pages 211-212. A continuation of work described in *Elektrochemie*, Vol. 38, Feb. 1932, pages 70-78. When Fe pentacarbonyl $Fe(CO)_5$, is slowly added to Hg at 300° C., a butter-soft, silver-white paste is formed, and, on continued exposure to light, this becomes covered with a dark skin consisting mainly of Fe. Paste normally contains a maximum of 10% Fe. Centrifuging raises the Fe content to 12% and distilling the Hg in a high vacuum results in formation of a strong and hard but unstable mass with a bright silver fracture and containing 15.2% Fe. In all these products, as with amalgam of low Fe content, most of the Fe is present, as shown by X-ray analysis, as α-Fe, such as a suspension of α-Fe in Hg. Similarly, if Ni carbonyl, $Ni(CO)_4$, is added to Hg, a hard, brittle, matte-gray mass results, containing 8.83% Ni and which is stable in air. It has a cubic lattice, different from that of pure Ni. Ha (3)

The Density of Ferrosilicons (Sur la densité des ferrosiliciums). CH. BEDEL. *Comptes Rendus*, Vol. 195, July 25, 1932, pages 329-330. Density of ferrosilicons is determined for various compositions and experimental numbers compared with numbers calculated from theoretical density hyperbola. Considerable variations are found at points corresponding to $SiFe_2$ and SiFe. No alloy showed expansion; formation of SiFe resulted in considerable contraction. There was no sensible change of volume during the formation of $SiFe_2$. OWE (3)

Allotropy in Iron and Steel. R. H. HARRINGTON & W. P. WOOD. *Transactions American Society for Steel Treating*, Vol. 20, Dec. 1932, pages 529-548. Authors offer further justification of their 2-stage allotropy theory in form of thermal analyses of a special series of 32 steels. Recently published works of other investigators is discussed in light of authors' theory. The 2 stage mechanism makes unnecessary the postulation of metastable forms of Fe discussed by Hanemann and Schrader. This mechanism may be applied to other phenomena and problems such as austenite-pearlite transformation, formation of granular and lamellar pearlite, normality and abnormality of steels, structures of quenched and drawn steels, and structures and transitions in some alloy steels. 24 references. WLC (3)

The Development of Structural Steel ST 52. (Die Entwicklung des Baustahls ST 52.) H. KOPPENBERG. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Oct. 29, 1932, pages 1077-1082. German and American structural steels are reviewed; ST 52 has found an ever increasing use in Germany during last few years, so that up to end of 1931 more than 120,000 tons were consumed. Average analysis (which varies according to several makers) is about 0.12-0.25 C, 0.5-1.1 Si, 0.75-1.6 Mn, 0.25-1.0 Cu; sometimes 0.4-0.6 Cr or 0.15-0.25 Mo is added. Material is fully equivalent to the more expensive 3% Ni steel, and very similar to American structural steels. Ultimate strength is about 63 kg./mm.^{2}, elastic limit 45 kg./mm.^{2} with 24.7% elongation. Steel maintains in the weld when electrically welded the full strength of material. A comparative table of permissible stresses in America and Germany when used in bridges, cranes and other structures is given. 12 references. Ha (3)



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Investigation at Elevated Temperatures of Some Types of Steel manufactured by Izhorskii Mill. S. I. Volfson. *Neftyanoe Khozyaistvo,* Vol. 22, June 1932, pages 335-341; Vol. 23, Aug. 1932, pages 97-104. Seamless tubes manufactured in Izhorskii steel mills for V. G. Shukhov and M. A. Kapelyushnikov cracking units from "C" steel were tested within a range of 20° to 700° C. in a Gagarin press (0.0073 mm./sec.) speed being held constant during entire procedure. Brinell test was carried out, by loading for 10 sec. and leaving sample under load for another 10 sec. Steel had the following chemical composition:

Type	% C	S	P	Mn	Cr	Ni	Si	
"A"	0.32	0.047	0.02	1.39	0.9	5.15	0.34	Milled ingot
"B"	0.31	0.064	0.07	1.1	0.67	5.21	0.45	Ingot
"C"	0.34	0.060	0.083	1.35	.....	0.2	0.34	Seamless tube
"D"	0.35	0.058	0.025	0.83	.....	.....	0.12	Tubes 168 mm. in diam. and 11 mm. thick

Impact test was carried out with samples prepared according to Schwartz measuring 53.3 x 10 x 10 mm. while fatigue test samples measured 9 x 20 mm. neck having 5 mm. Breaking tests carried out at 20°-680° C. was made for every 100° C. of temperature raise whereby tensile strength, proportional limit, elongation, cross sectional reduction, kinetic resistance and effect of deformation on breaking strength were determined. Tensile strength was characterized by a tensile decrease for all samples except "D" within temperature range of 100°-200° C., followed by an increase up to 300° amounting at 600° C. to 1/6-1/4 of that at room temperature. Proportional limit decreases for all steels with increase in temperature. Kinetic resistance does not show any change from 20° to 400° C. after which a rapid drop takes place, while at 600° C. and higher curves of kinetic resistance run parallel to those of temporary resistance. Elongation of special steels "A" and "B" increases only slightly up to 300° to 400° C. while C steels show a lowering which is characteristic for temperatures of 100° to 200° C. cross section reduction of kinetic resistance does not show any regularity. Value for cross section reduction increases for all steels at 300° to 500° C. This value increases continuously for C steel up to 700° C. while it decreases for steel "B" after 600° C. and increases again after 700° C. Deformation diagrams show a lowering up to 200° C., followed by an increase with a maximum at 300° C. and a steep decrease above 400° C. Influence of temperature on Brinell strength of metal is slightly lowered at 100° to 200° C. increasing to a maximum at 300° and decreasing rapidly after 400° C. This drop is considerably higher for "A" than for "C" and "D". Influence of temperature on impact test shows a maximum at 100° to 200° C. and a minimum at 500° C. The extreme brittleness of "C" may be explained by the high content in S. Creep tests show that continuous strength at 400° C. lies considerably above 0.2% limit while at 500° C. it is below 0.1%. Attention is drawn to brittleness at 450° to 550° C. this being operating temperature of cracking coils. A great number of tabular data and plots reproducing details of tests are given in original paper. AAB (3)

Nickel-Chromium-Silicon Cast Irons. A. L. Norbury & E. Morgan. *Iron & Steel Industry & British Foundryman,* Vol. 6, Oct. 1932, pages 23-26; *Engineer,* Vol. 154, Sept. 23, 1932, pages 309-310; *Engineering,* Vol. 134, Sept. 16. 1932, pages 345-346; Sept. 23, 1932, page 351. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 99. LFM + CHL (3)

Hipernik and Other Magnetic Alloys—Great Improvements Due to Heat Treatments. T. D. Yensen. *Metal Progress,* Vol. 21, June 1932, pages 28-34, 70. In manufacture of audio frequency transformers of Hipernik (50% Fe, 50% Ni) where maximum permeability and low hysteresis loss are desirable, marked variations in these magnetic properties were encountered. Microscopic examination revealed numerous inclusions in poor specimens. Manufacturing process involved hot rolling to 33 mm., punching and vacuum or N annealing at 1650° F. Effect of rolling operation was determined by substituting cold for hot rolling with no improvement resulting. This indicated that impurities were oxides formed during melting. In order to correct this difficulty specimens were annealed in a stream of H at 1000° C. for 8 hrs. This treatment produced great improvement and was adopted for production with results as follows: 50% Ni alloy before treatment 5,000 maximum permeability, 1,000 ergs, hysteresis loss; 50% Ni alloy after treatment 80,000-150,000 maximum permeability, 100 or less hysteresis loss. WLC (3)

Invar, Elinvar and Related Iron-Nickel Alloys. J. W. Sands. *Metals & Alloys,* Vol. 3, June 1932, pages 131-135, 150; July 1932, pages 159-165. Author has assembled considerable data on this type of alloys whose expansion characteristics have been very thoroughly investigated over entire range of Fe-Ni system. With proper selection of composition it is possible to obtain an Fe-Ni alloy of any desired expansion characteristics from that of minimum expansion alloy Invar, 36% Ni, up to those of pure Ni. Effects of temperature on expansivity are discussed. Effect of various impurities such as Mn and C on expansion properties and inflection temperature are discussed. Addition of Co to effect a reduction in expansion is discussed and formula given for calculating compositions for desired expansion characteristics. Requirements as to maintenance of Fe/Ni ratio when Co is added are discussed. Effects of other alloys on Ni content of minimum expansion alloy are shown graphically; Cu and C lower amount of Ni required and Mn and Cr increase it. Commercial applications of these alloys on account of their expansion characteristics are discussed. Effect of cold work and heat treatment on expansion, constancy of dimensions of Invar are discussed. Mechanical properties of range of Ni-Fe alloys are discussed and a table covers compositions from 20-60% Ni. Elinvar, of low thermal coefficient of elasticity is discussed, its composition and applications given. Constitutional diagram of Ni-Fe alloys is given and discussed. Variations in electrical and thermal conductivity with composition are shown. WLC (3)

Castings of Corrosion-Resistant Steels. Jerome Strauss. *Proceedings American Society for Testing Materials,* Vol. 32, Part II, 1932, pages 213-230, discussion 230-237. A contribution to Symposium on Steel Castings held jointly by A.S.T.M. and American Foundrymen's Association, June 1932. A tabulation with detailed discussion of physical and chemical properties of Cr, Cr-Ni and Ni-rich alloys. A few broad generalizations are made. Low-C and low-Si castings, more particularly the former, are a tax upon the foundryman's facilities and the best materials available for his use. The Cr steels are well suited to resist oxidizing acids, oxidizing gases, and sulphur-rich gases, at high temperatures, but are unsuited to high stresses at high temperatures or to numerous and sudden variations in stress or temperature. The high-Ni Fe-Cr alloys are unsuited to sulphur-rich gases at high temperature but may be satisfactory at moderate temperatures with reduced sulphur compounds. They are valuable for resisting great stress at high temperature and sudden changes in stress and temperature. Some of these alloys are almost immune to oxidizing acids and are very satisfactory in H_2SO_4, while others possess oxidation resistance to a greater degree than the plain Cr steels. In fact, practical trials under very severe conditions indicated a number of years ago that a medium-C, Si-containing alloy having about equal proportions of Fe, Cr, and Ni was the most satisfactory one from the viewpoint of both strength and stability. Experimental evidence seems about to confirm these findings. VVK (3)

Molybdenum-Manganese Alloy Steels. W. F. Rowden. *Metallurgia,* Vol. 7, Nov. 1932, pages 9-10. Steels containing from 1.40 to 1.70% are useful for structural purposes where a better steel than the ordinary is required but where cost is an important factor. The addition of between 0.20 and 0.40% Mo decreases or eliminates the susceptibility to temper brittleness and increases the depth-hardening properties. Property charts for the steels containing from 0.15 to 0.20 and from 0.20 to 0.30% C are shown. JLG (3)

The Transverse Impact Strength of Plain Carbon, Normalized Steels. M. W. Lightner & C. H. Herty, Jr. *Mining & Metallurgical Investigations, Carnegie Institute of Technology & Mining & Metallurgical Advisory Boards, Coöperative Bulletin* 59, 1932, 34 pages. Factors affecting impact strength of plain C basic open-hearth steels in normalized condition and effect of furnace practice on these factors were investigated. From exhaustive data presented following summary of conclusions may be given: Under same conditions, amount of ferrite which transforms from austenite is major factor in determining impact strength; latter is increased by an increase in percentage of Mn in solid solution in the ferrite. Shock resistance of steels with more than 0.2% C is lowered by increasing P content. Inclusions do not affect dynamic properties of normalized steel except when there is an excessive segregation, especially of alumina or aluminum silicate. Grain size did not show a pronounced influence; it was found that the larger the grains the less ferrite will be formed in normalizing so that impact strength is lowered in this proportion. Proper furnace operation and complete deoxidation can control all variables and impact value fairly accurately calculated by ferrite content. Method is recommended for study of alloyed steels. Ha (3)

Wear of Metal in Muller Tires in the Clay Industry. J. Mayer. *Brick & Clay Record,* Vol. 81, Nov. 1932, page 168. Mn steel is the toughest of steels but requires impact shock to harden it so that it is resistant to abrasives. Chilled Fe though extensively used wears quickly after the chill is worn through. The surface of the tire also has a tendency to wear concave. This same difficulty is found with alloy irons. Cr-Mo alloy steel, properly heat treated has shown longer performance qualities. Tests have been made using clays, shale, silica, glass, sand, ganister rock, feldspar, coal, ores, zinc, emery, silicon carbide, sillimanite or mullite, and aluminum oxide. Several service reports are cited. CBJ (3)

High-Test Cast Iron in the United States of America. R. S. Macpherran. *Foundry Trade Journal,* Vol. 47, July 14, 1932, pages 16-19 and 25. An article accompanied by 6 figures and 1 table, containing the results of physical tests from a number of arbitration test bars of Fe melted in 54" and 72" cupolas. The author defines high-test Fe and then deals with the various processes used in its production, tabulating them as electric furnace, air furnace, and cupola processes. Reference is made to Meehanite and Ermalite, and details are given of the practice of American founders manufacturing high-test cast Fe in the cupola (without forehearth). OWE (3)

The Segregation of Ferrite and Cementite from Austenite. R. F. Mehl, C. S. Barrett & D. W. Smith. *Mining & Metallurgical Investigations, Mining & Metallurgical Advisory Board, Carnegie Institute of Technology, Progress Report* 6th Open Meeting, Oct. 28, 1932, 6 pages. Includes discussion. Study of mechanism operating in formation of ferrite from austenite in slowly cooled alloys leads to conclusion that it can be predicted from geometrical relationships obtaining between γ and α Fe on basis of minimum displacement of atoms and that same holds true for martensitic structures. Figure formed in hypereutectic alloys depends probably on relation between austenite and cementite. Type of structure obtained depends not only upon crystal structure of parent solid solution but also on crystal structure of precipitate. Ha (3)

Recent Development of Cast Iron. (Streiflichter auf die neuste Entwicklung des Gusseisens.) H. Meyersberg. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 11, 1932, page 495. Abstract of paper before annual meeting of Verein deutscher Giessereifachleute, Nov. 12-13, 1932, Berlin. On basis of statistical research results, author shows that high test cast Fe can be produced with greatest operating reliability. This is discussed for Lanz method, Stabil casting method according to Borsig-Hanemann and Emmel-Thyssen method. Essential for physical properties is control of C content which is performed with greatest accuracy according to Sipp method. Relations between tensile properties and other properties such as machinability and wear are discussed. Research on growing is reviewed. GN (3)

Increase of Strength by Refining in Relation to Different Original Structures. (Vergütefestigkeiten in Abhängigkeit verschiedener Ausgangsgefüge.) O. v. Keil & O. Jungwirth. *Stahl und Eisen,* Vol. 52, Dec. 8, 1932, pages 1221-1223. Some regulations for refining of steel (as for instance the American) requires that steel should be normalized before refining. Experiments with a Cr and a Cr-Ni steel the tensile strengths of which were greatly deteriorated by too high forging temperature, showed that a simple refining removed deterioration to a large degree, although structure still indicated overheating. Normalizing before refining removed also last remaining differences in tensile strength completely. Drawing tests showed that tempering takes place at lower temperatures with coarse-grained than with fine-grained structure. Ha (3)

Alloy Steels for Locomotive Rods. B. Reed. *Iron & Steel Industry & British Foundryman,* Vol. 6, Jan. 1933, pages 145-146. Briefly outlines properties of several Ni-Cr and Ni-Cr-Mo steels. CHL (3)

Tool Steels. Production, Working, Analyses, Application and Heat Treatment. (Werkzeugstähle. Herstellung, Verarbeitung, Analysendaten, Anwendungsgebiete, Wärmebehandlung.) F. Rapatz. *Eidgenössische Materialprüfungsanstalt,* Zurich, Report No. 64, 1932, pages 15-21. Production, selection and treatment of most important tool steels with special reference to failures, effect of C and other alloying metals on properties are considered. Among steels dealt with are cutting steels, various types of cold forming steels, steels for working bakelite, hot forming and rust resisting cutlery steels and high % Mn steel. GN (3)

Structural Steels. Production, Working, Analyses, Application and Heat Treatment. (Baustähle. Herstellung, Verarbeitung, Analysendaten, Anwendungsgebiete, Wärmebehandlung.) W. Oertel. *Eidgenössische Materialprüfungsanstalt,* Zurich, Report No. 64, 1932, pages 5-14. Gives a brief account of historical development of structural steels and deals in detail with the present status of production, forming, composition, heat treatment and application of C, Si, Mn, Cr, Ni and similar alloy structural steels. Graphs show mechanical properties. GN (3)

Physical and Mechanical Properties of Some Well-Known Cast Steels. C. H. Lorig & C. E. Williams. *Proceedings American Society Testing Materials,* Vol. 32, Part II, 1932, pages 114-196. A comprehensive compilation of physical properties of cast steels of following types: plain steels (0.22-0.35% C; less than 0.22% C; more than 0.35% C); medium-Mn steel (1-2% Mn, 0.20-0.50% C); Ni-Mn steels (1-1.75% Ni, 1-1.5% Mn, 0.30-0.40% C); Si steel (0.45-1.30% Si, 0.73-1.22% Mn, 0.14-0.39% C); Cu steel (0.5-5.0% Cu); Ni steels (0.5-5.0% Ni, 0.10-0.60% C) Ni-Mo steels (0.43-2.11% Ni, 0.19-0.62% Mo, 0.09-0.29% C); Mo steel (0.29-0.80% Mo, 0.19-0.37% C); Mn-Mo steels (0.20-0.40% Mo, 1-1.75% Mn, 0.30-0.40% C); Mo-V steel (0.25-0.35% Mo, 0.10 V, 0.35-0.45% C); V steel (0.18-0.60% V. 0.22-0.36% C); complex V steels; Cr, Cr-Ni and complex Cr steels (ranging up to 5% of alloy elements). VVK (3)

Research. Report of A.S.T.M. Committee E-9, H. F. Moore, Chairman. *Preprint* No. 7, June 1932, *American Society for Testing Materials,* 3 pages. Research Committee on Yield Point of Structural Steel has started a series of tests to determine effect of aging on yield point of structural steel. Joint Committee on Effect of Phosphorus and Sulfur in steel is carrying on further tests at Watertown Arsenal to determine effect of S on forging steels. A.S.M.E.-A.S.T.M. Joint Committee on Effect of Temperature on the Properties of Metals is carrying on experimental work on high-temperature creep properties of Ni-Cr austenitic steels at Battelle Memorial Institute, and tests on fatigue strength of same steels at elevated temperatures are being made at the University of Illinois. Progress reports on other projects. VVK (3)

Report of Sectional Committee on Standardization of Dimensions and Material of Wrought-Iron and Wrought-Steel Pipe and Tubing. H. H. Morgan, Chairman. *Preprint* No. 28, June 1932, *American Society for Testing Materials,* 2 pages. Progress report. VVK (3)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION (4)

The Corrosion Problem on Gasworks and Coke Oven Plants. R. B. Stucke. *Gas Engineer,* Vol. 49, Feb. 1932, pages 69-72. A review of the available materials for plant construction and protective coatings. The favorable behavior of the following 3 serviceable metals and alloys in gas plants are stressed: Pb, special bronzes and Al. Pb is used for parts, linings, etc. at the ammonia sulphate plant. Sulphate centrifugals have baskets of bronze or Monel metal and parts are Pb-lined. In the NH_3 still room, valves, fittings, and pipes may be either Pb-lined or of Al. Since pure Al is too soft, an 8% Si alloy is employed. The mains in which gas is distributed are made of cast Fe, wrought Fe or steel. The means of additional protection against soil corrosion are taken up. WH (4)

Destruction of a Plain Tube Economizer due to Interior and Exterior Corrosion. Practical Experiences. (Zerstörung eines Glattrohrekonomisers durch innere und äussere Korrosion. Betriebserfahrungen.) *Brennstoff und Wärmewirtschaft,* Vol. 14, Feb. 1932, pages 30-31; *Die Wärme,* Vol. 55, July 16, 1932, page 504. Uniform corrosion attack from outside reduced wall thickness of 12 mm. tubes by 2¼-3¼ mm. Corrosion effects gradually increased up to 6.5 mm. toward exit of waste gases, i.e. toward entrance of boiler water, while no corrosion was noticed at opposite end of counter current system. Since boiler water has entered for years at a temperature of 10°-25° C., corrosion is ascribed to under-cooling of waste gases below dew point. Heavy pittings on inside of tube walls destroyed a layer of 6 mm. thickness. Boiler water, which was softened according to lime-soda method, was very rich in gases. EF (4)

Corrosion costs industry many thousands of dollars. Are you keeping up-to-date on this important subject?

The Passivity of Gold. William James Shutt & Arthur Walton. *Transactions Faraday Society,* Vol. 28, Oct. 1932, pages 740-752. The fall in potential during spontaneous reactivation of a passivated gold anode was examined under conditions presenting depolarization and the following table gives part of the results obtained:

Time of Recovery of Gold (Vigorous stirring)

Temp °C	Conc. Hcl N	C.D. Amps./cm.²	Time Seconds
25	1.0	0.90	0.670
25	1.0	1.02	0.660
25	1.0	1.48	0.769
25	4.0	2.5	0.032
25	2.0	1.5	0.18
25	1.0	1.5	0.77
25	0.50	0.7	2.9
25	0.25	0.3	12.8
14.9	1.0	1.50	2.10
45.0	1.0	1.50	0.174
65.4	1.0	1.50	0.044

The high temperature coefficient suggests that the rate of recovery is controlled by a chemical reaction distinct from simple solution of film and diffusion of the products. The film is not more than one or two molecular layers in thickness and consists initially of some higher oxide. After the passivating current has been cut off, this peroxide reacts with chloride to produce chlorine and auric oxide, the latter subsequently dissolving in acid solution. PRK (4)

Avoidance of Corrosion of Idle Boilers by Means of Ammonia. (Erhaltung stillstehender Kessel mit Ammoniak.) Erich Seyb. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 14, Jan. 1933, page 16. Following method is described to avoid corrosion of idle boilers. According to size boiler water is mixed with a certain amount of ammonia under a certain pressure. NH_3 combines with H_2O to form NH_4OH which prevents corrosion owing to its OH ion concentration. GN (4)

Modern Metals. For Corrosion, Heat and Abrasion Resistance. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 497-512. Revision and expansion of Metals and Alloys section of "Materials of Construction for Chemical Engineering Equipment" as published in Sept. 1929. Manufacturer, composition, mechanical and physical properties and machining qualities of 258 alloys are listed. Materials recommended by manufacturers for use with over 100 corrosive chemicals are tabulated. PRK (4)

Modern Materials. News of Progress in Corrosion Resistance. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 513-523. Compendium of short articles on recent developments and new uses of corrosion resisting alloys and corrosion prevention methods. PRK (4)

Corrosion by Cavitation in a Diffusor. (Korrosion bei Kavitation in einem Diffusor.) H. Schröter. *Werft, Reederei und Hafen,* Vol. 13, Sept. 1, 1932, page 257. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 30. WH (4)

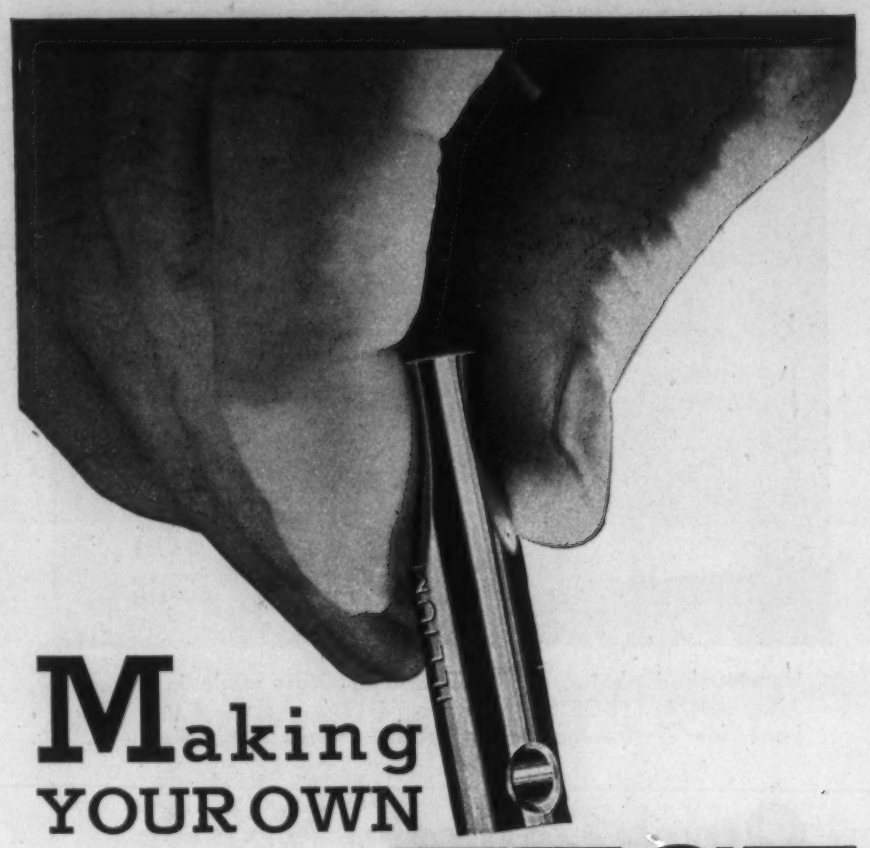
Corrosion of Austenitic Chrome Nickel Steels. (Corrosion des aciers austenitiques chrome-nickel.) Sanfourche & A. Portevin. *L'Usine,* Vol. 41, Aug. 19, 1932, page 25. See "A Peculiar Type of Corrosion in Chrome-Nickel Austenitic Steels," *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 101. Ha (4)

The Open-Air Corrosion of Copper. III. Artificial Production of Green Patina. W. H. J. Vernon. *Metal Industry,* London, Vol. 41, Dec. 30, 1932, page 634. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 32. Ha (4)

Accelerated Weathering Tests of Soldered and Tinned Sheet Copper. P. R. Kosting. *Metal Industry,* London, Vol. 41, Aug. 5, 1932, pages 133-135; Aug. 12, 1932, pages 148-149. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 293. Ha (4)

Corrosion Studied in Laboratories of U. S. S. R. Correspondence from G. W. Akimow. *Metal Progress,* Vol. 22, Aug. 1932, pages 49-50. Brief account of 2 general conferences on corrosion held in 1929 and 1932 at Moscow. WLC (4)

How Rustless Steels React to the Salt Spray Test. W. B. Arness & J. N. Ostrofsky. *Iron Age,* Vol. 130, Dec. 1, 1932, page 837, adv. sec. page 14. Abstract of paper read before the American Society for Steel Treating at Buffalo. Gives results of salt spray tests on rustless Fe-Cr alloys. All alloys proved resistant and only a few showed even progressive rusting after 500 hr. exposure. VSP (4)



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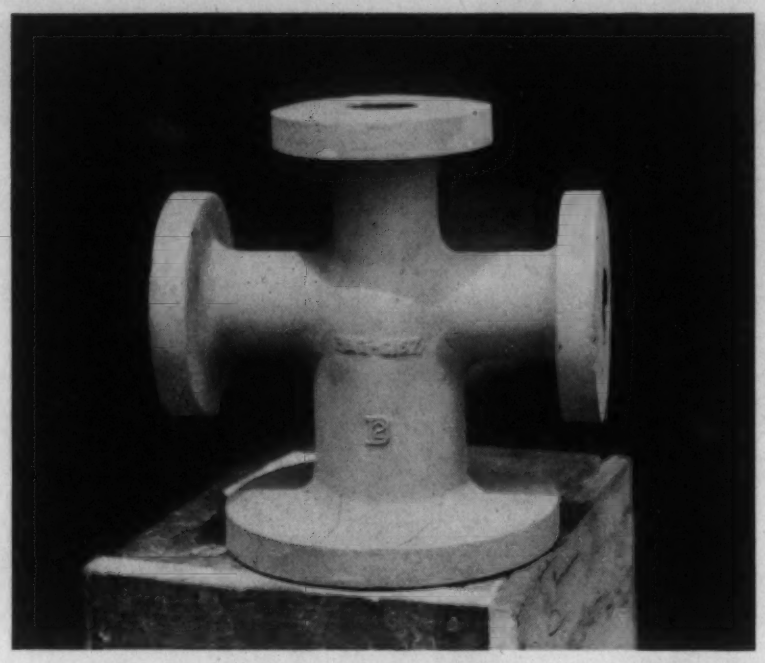

Unretouched photograph of Reducing Cross made in Durco Alloy KA25 (18-20% chromium, 8-10% nickel, .07% carbon) for an internationally known chemical manufacturer.

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If you have any problems involving corrosion, our representative in your territory will be glad to call, or, if you prefer, write us direct. We may know the solution to your problem.

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Investigations on Suitability of Various Brands of Steel Wires to be used in Sieves of Coke, Ore and Coal Dressing Plants. (Untersuchungen über die Eignung verschiedener Stahldrahtsorten bei der Verwendung in Sieben für Koks-, Erz- und Steinkohlenaufbereitungen.) ERHARD KÖRNER. Doctor's thesis, Technische Hochschule Breslau, July, 1932, 35 pages. Investigation endeavors to elucidate occurrences of wear and resistance to abrasion of sieves by using various brands of steel wires in sieves of coke, coal and ore classification plants. Results show that so many factors affect wear of materials that resistance to abrasion cannot be clearly established. As a rule, values on tensile strength and C content of wires are in accordance with results of wear tests. Proper dimensioning of sieves is of great importance to decrease loss through abrasion. Improper dimensioning of sieves means considerable waste of material. Higher tensile strength of wires seems to be favorable. Resistance to abrasion of cast steel wires and heat treated steel wires does not differ considerably from that of common low C steel wires. A 12% Mn steel showed highest resistance to wear. It is to be decided in each case whether or not use of high quality steel wires in classification sieves is economical. 27 references. GN (4)

Combating the Corrosion Problem with Lubricated Valves. G. F. SCHERER. *Gas Engineer,* Vol. 6, Jan. 1932, pages 23-25. Problem can be attacked from 2 directions (1) from standpoint of materials used in construction of valves and (2) from standpoint of design of valves employed. Selection of suitable corrosion resistant alloys is treated in a more general manner whereas attention is focused on advantages of plug-cock design. In this type of valve, when fully opened, no part of machined surface of the valve is exposed to corrosive or erosive action of the fluid. WH (4)

Intercrystalline Embrittlement of Metals. G. B. O'MALLEY. *Commonwealth Engineer,* Vol. 19, June 1, 1932, pages 375-378. Paper read before Melbourne University Metallurgical Society. A common form of failure of metals is known as season or corrosion cracking and occurs with certain metals either on standing or after exposure to certain solutions. Investigations have shown the fractures so formed to be characteristically intercrystalline, and as a result of research into the cause, this phenomenon is now known as intercrystalline embrittlement. Fracture of metals at grain boundaries may follow contact with gases, liquid reagents or molten metals and alloys. A practical example is the failure of steel on being brazed. The development of weakness of the crystal boundaries is ascribed to the greater chemical reactivity due to the asymmetrical situation of the atoms which involves unsatisfied attractive atomic forces. The preferential etching of grain boundaries would thus be accounted for, likewise the greater volatility. WH (4)

The Peculiar Oxidation of a Church Bell. (Über eine eigentümliche Oxydationserscheinung an einer Kirchenglocke.) WILHELM WITTER. *Metallwirtschaft,* Vol. 12, Jan. 13, 1933, pages 21-22. A 30 year old bronze church bell in a church situated in a high spot in Halle was observed to be corroding considerably on the inside, while a newer bell in the same church and other bells in the same city were not corroded. The scale which had formed contained .35% Cl, 8.24% S mostly in the form of SO_4, 2.41% Fe and 8.00% SiO_2. On the outside of the bell there was no corrosion, but a patina had formed. The bells are exposed to the atmosphere and there is a paper mill nearby which produces S fumes. Chemical analysis was made of the old and new bells, also of several other bells which did not corrode:

	Old Bell	New Bell	Other Bells 1	2	3
Sn	16.75	18.20	18.80	19.74	19.80
Cu	76.50	75.50	77.10	75.81	75.70
Pb	2.46	2.05	1.25	2.36	1.60
Sb	.72	.18	.70	.56	.20
Zn	.89	1.76	2.15	.80	1.00
Ni	.05	Trace	Trace	.40	.20
Fe	2.17	1.49	Trace	.35	.40
S	.42	.32			
As	.12	.30	.19		.27

It is concluded that the high Fe and S contents of the old bell make it more subject to corrosion in the atmosphere containing S than the other bells. CEM (4)

Copper Service Pipes. *Gas Journal,* Vol. 199, Aug. 10, 1932, page 302. Paper presented before 25th Annual Convention, Canadian Gas Association, by Research and Engineering Department, Mueller, Ltd., of Sarnis, Ontario. Thin walled Cu pipe has an extraordinarily high tensile strength and is made from Cu approximately 99.9% pure. This exceedingly high tensile strength as applied to water services, recommends the pipe very highly because of its resistance to frost action and settlement of soils. Except in soils impregnated with acids formed by moisture in contact with Fe oxides, such as cinders, etc., Cu pipe is highly resistant to action of soils which causes extensive and rapid corrosion on steel or Fe pipe. Because of its high conductivity it is less affected by electrolysis if proper care is exercised in insulating its contact with other more resistant metals. Where laid in shelves in trenches for water or other classes of mains its tensile strength limits leaks caused by soil settlement or other causes. MAB (4)

Corrosion of Water Mains. *Commonwealth Engineer,* Vol. 20, Oct. 1, 1932, page 76. Estimate of the Sidney Metropolitan Water and Sewage Board reveals an annual loss by the deterioration of unlined cast Fe water mains amounting to £225.000. Corrosion also reduces the capacity of the system and entails heavy maintenance cost. It is estimated that the capacity is reduced 50% in 15 years. Present day practice is to use cement lining, applied by the centrifugal process, for all new mains, but the difficulties in special castings are admitted. Data on investigational and experimental work along the latter lines are presented. Passing mention is made of the Eric process (Eric Engineering Co., Cheapstown, England). After the length of main has been scraped and flushed out it is filled with a special emulsion of bitumen. An electrode, fed by a current from a portable generator, is then drawn through the main, and this effects electrical deposition of bituminous material. The surplus emulsion is then drawn and pumped out and after flushing the main is ready for service. WH (4)

By-Product Chemicals and Aluminum. (Brennstoffchemische Produkte und Aluminium.) *Brennstoff-Chemie,* Vol. 12, May 1, 1932, pages 174-175. Pure Al-samples suspended for several weeks in crude tar remained completely unattacked. Slight changes at surface were noticed on specimens exposed to heavy oil at 20°-30° C. Raising temperature to 90° C. caused moderate corrosion attack which is ascribed to carbolic acid. Soft annealed Al-sheets were less corroded than hard rolled samples. Al-retorts are not applicable to tar oil containing phenol. Al-panels of 99.4% purity were exposed to 1, 3, 10, 50 and 75% carbolic acid in rolled and annealed state. They were not attacked at room temperatures and only slightly at 60-70° C. Anhydrous carbolic acid dissolves Al at boiling temperature (180° C.). Al-apparatus satisfactorily withstood mixtures of carbolic acid and formaldehyde. Montan wax did not react with Al-samples even when they were boiled in montan wax-water-alcohol for 72 hours. Neither petroleum nor Al-samples (99.2%) showed any change after being in contact for 14 days. Al-samples placed in the reflux condenser for 50 hours exhibited no corrosion, while Cu wires lost 0.7 g./m.^{2} surface area and Fe wires lost 4.3 g./m.^{2} after 24 hours. Al is not attacked by benzol. Utilization for measuring rods and evaporation dishes is suggested. The absence of sparks and elimination of explosion danger are pointed out. EF (4)

A Modified Impingement Corrosion Apparatus. H. W. BROWNSDON & L. C. BANNISTER. *Engineering,* Vol. 134, Nov. 11, 1932, pages 581-582. Condensed from paper before the Institute of Metals, Sept. 14, 1932. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 102. LFM (4)

STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Metallographic Polishing. Correspondence from SAMUEL EPSTEIN. *Metals & Alloys,* Vol. 3, Sept. 1932, page 207. Comments on Vilella's method of preparing specimens of cast Fe for the microscope and favors use of intermediate wet abrasives. WLC (5a)

Application of Binary and Ternary Diagrams to the Study of Effect of Sulphur on Steel and Cast Irons. (Application des Diagrammes Binaires et Ternaires à l' Etude de l'Influence du Soufre sur les Aciers et les Fontes.) J. R. MARECHAL. *La Fonderie Belge,* Vol. 2, May 1932, pages 69-75. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 4. FR (5a)

Rate of Precipitation of Nickel Silicide and Cobalt Silicide in the Hardenable Copper-Nickel-Silicon and Copper-Cobalt-Silicon Alloys. C. L. WILSON, H. F. SILLIMAN & E. C. LITTLE. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 11, Feb. 1933, 12 pages. Alloys were prepared to contain various amounts of Ni_2Si or Co_2Si. Quenched alloys were aged at several temperatures and the hardness and electric resistance plotted as a function of time at aging temperature. The rate of precipitation as estimated from these curves first increased as the aging temperature increased and then decreased, the change of rate occurring in the neighborhood of 600° C. The phenomenon suggested the "possibility of another transformation in Corson's $\alpha + Ni_2Si$ field." The solubility of Co_2Si at elevated temperatures was found to be greater than given by Corson. JLG (5a)

Formation of Graphite in Cast Iron. (Die Bildung von Graphit im Gusseisen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Nov. 27, 1932, page 476. Paper considers the points to be borne in mind in investigating the formation of graphite in cast Fe, namely the actual formation of graphite, its amount, form and distribution. Various theories on the formation of graphite in the melt are outlined, with special reference Honda's theory on the catalytic formation by the reaction of Fe_3C and CO_2. GN (5a)

Residual Austenite in Quenched Steel. S. S. STEINBERG & V. ZUZIN. *Vestnik Metallopromishlennosti (Metal Industry Herald),* Vol. 12, Feb. 1932, pages 2-6. (In Russian.) Steels containing 0.62-1.60 C were studied magnetically to determine the amounts of austenite left after different quenching cycles. The amount of the residual austenite grows with the increase of C. The rise of quenching temperature increases its content to 950°-1000° C. and then decreases. The amount of the residual austenite depends on speed of cooling, slower speed produces more austenite. With 1.60% C an inverse action takes place and higher speed produces more austenite. No decomposition of austenite was observed on aging at 100° C. for 6 hours. Quenching lamellar and spheroidized pearlitic steels at 750° C. results in higher residual austenite in the former. (5a)

The Nature of Transformation Stages from Austenite into Pearlite. I. S. ROGINSKI. *Vestnik Metallopromishlennosti, (Metal Industry Herald),* Vol. 12, June 1932, pages 48-51. (In Russian.) A presentation of Sauveur's views on transformations taking place in Fe on quenching. (5a)

The Influence of Third Metals upon the Constitution of the Brasses. IV. The Influence of Aluminum. (Der Einfluss von dritten Metallen auf die Konstitution der Messinglegierungen. IV. Der Einfluss von Aluminium.) O. BAUER & M. HANSEN. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft XXI, 1933, pages 3-18. See *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 320. (5a)

Fiber and Flakes in Chromium Steel. SAKHAROV & BARINOV. *Vestnik Metallopromishlennosti (Metal Industry Herald),* Vol. 12, May 1932, pages 70-72. (In Russian.) The study of 4 heats of open hearth steel showed that the formation of fiber and flakes is not connected with metallic and metalloid segregations but depends exclusively on the presence of non metallic inclusions of different types. (5a)

Structural Formation in Fine Sheets of Mild Ingot Steel on Annealing. (Die Gefügeausbildung von Feinblechen aus weichem Flussstahl durch Glühung.) WERNER BUSSON. *Stahl und Eisen,* Vol. 52, Oct. 27, 1932, pages 1045-1047. Paper gives brief discussion of influence of time and temperature of annealing on grain formation after different degrees of cold-deformation as well as of tempering and strain release, recrystallization and possibilities of failure of these methods. MGL (5a)

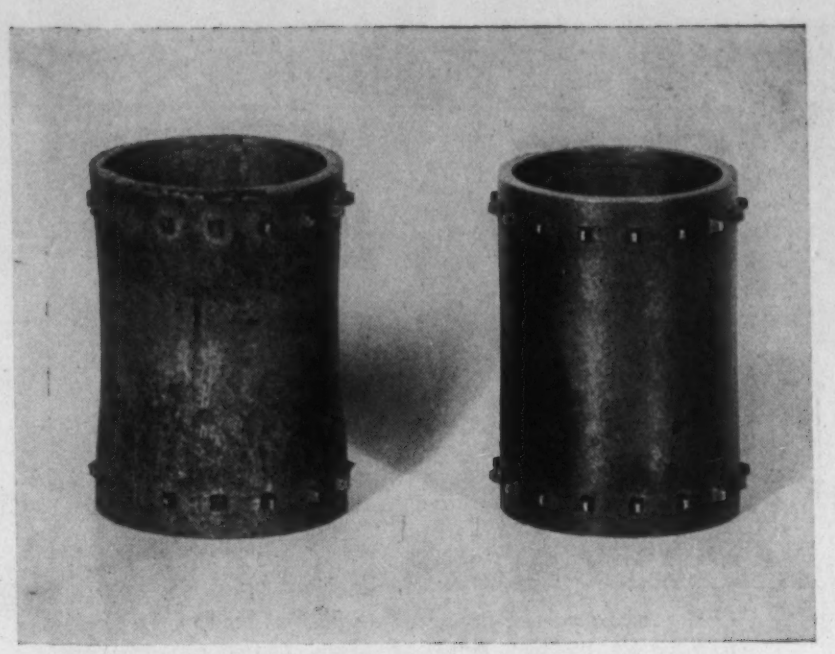
On the Equilibrium Diagram of Iron-Nitrogen Alloys. S. NISHIGORI. *Kinzoku no Kenkyu,* Japan, Nov. 1932, pages 490-510. Electrolytic Fe wire of 0.5 mm. diameter was nitrided by pure ammonia. To obtain specimens of uniform structure, author annealed them at 650° C. for 40 days in an atmosphere of pure N, which was obtained by decomposition of Fe nitride. Special attention was paid to avoid even slight oxidation. Then electric resistance was measured on slow heating and cooling in a high vacuum of 1/10000 mm. Hg or in N gas at atmospheric pressure. Microstructure of specimens was studied, X-ray and magnetic analyses were also carried out. Thus author found that 2 eutectoid transformations take place at 608° and 645° C. on heating, corresponding to equilibrium $\alpha+\gamma' \rightleftarrows \gamma$ and $\gamma+\gamma' \rightleftarrows \epsilon$ respectively; and that decomposition of iron nitrides at high temperatures does not take place at definite temperatures but gradually. ϵ phase has hexagonal-close-packed lattice and γ', face-centered-cubic one. From these results author recommended diagram proposed by E. Leherer in 1930 as most probable one. KT (5a)

Segregate Structures of the Widmanstätten Type Developed from Solid Solutions of Copper in Zinc. M. L. FULLER & J. L. RODDA. *American Institute Mining & Metallurgical Engineers, Contribution* No. 13, Feb. 1933, 13 pages. Plates of ϵ phase were found to form on planes of the {10.4} form of the η phase (Zn containing Cu). Both phases have a hexagonal close-packed lattice. Orientation of the lattice of the precipitate could not be determined, but X-ray patterns indicated that the unique axes of the 2 phases were parallel. The probable arrangement is one in which (10.4) planes of the segregate are parallel to (10.4) planes of the matrix and the principal axis of the 2 phases are at an angle of 4°. Reasons why this is the most probable arrangement are given. A mechanism for the separation of the ϵ phase is suggested. 12 references. JLG (5a)

On the Formation of Lamellar Pearlite. Correspondence from R. G. GUTHRIE & J. A. COMSTOCK. *Metals & Alloys,* Vol. 3, Oct. 1932, pages 234-235. Discusses article of Albert Sauveur on precipitation hardening of steel (*Metals & Alloys,* Vol. 3, Aug. 1932, page 177) and presents ideas on sequence of various changes and mechanism of formation of pearlite. WLC (5a)

An Electrochemical Investigation of Solid Cadmium Gold Alloys. ARNE ÖLANDER. *Journal American Chemical Society,* Vol. 54, Oct. 1932, pages 3819-3833. Phase diagram of Cd-Au system has been completed, 3 new transitions having been found. MEH (5a)

Development of Natural Stresses by Tension (Die Entwicklung von Eigenspannungen durch Dehnen). V. CAGLIOTTI & G. SACHS. *Mitteilungen der deutschen Materialprüfungsanstalten,* Sonderheft 21, 1933, pages 49-52. Plastic deformation of crystals usually causes a widening of interferences in monochromatic X-ray pictures which is ascribed to presence of natural stresses; this seems true as these natural stresses mostly disappear with increasing temperature. Experiments were made to find the relation between degree of deformation and natural stresses, but no simple law could be discovered. The actual magnitude can, however, be calculated from compressibility of crystal which also permits determining the stored elastic energy. This energy was calculated for a Cu crystal to about 0.004 kg.-mm/m.^{3} 15 references. Ha (5a)



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BOTH spools illustrated above were made from a standard die cast alloy of the 93% zinc, 4% aluminum, 3% copper type but in one the tin was high, without sufficient magnesium to compensate. The resulting crystal growth caused the deformity which rendered the spool unusable.

IN THIS CASE a small sample and one and one half hours of time were necessary to make the spectrographic analysis. The wet method would have required several days of waiting and working with a 500 gram sample.

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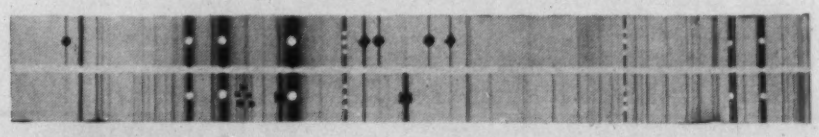
A short section from a spectrographic plate of the two sprocket spools is pictured below. The spool which failed gave the spectrogram at the top; note strong tin lines (marked with black circle). The good spool gave the spectrogram at the bottom. Note absence of tin and presence of magnesium (marked with black square). Spectrography gives the entire analysis in one picture.



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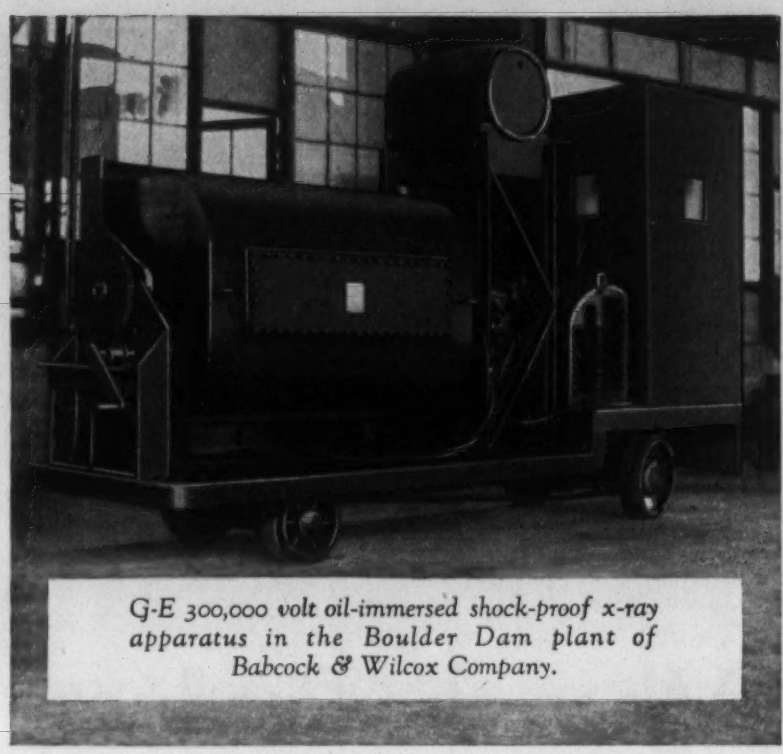

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DOWN within the Black Canyon of the Colorado River engineering history is in the making. Construction crews are burrowing in the man-made bowels of these volcanic mountainsides, installing the mammoth conduits and penstocks for Boulder Dam. Sections of plate-steel pipe up to 30 feet in diameter, 24 feet long, 2¾ inches thick and weighing about 150 tons, are being lowered from a cableway 600 feet above the landing stages and placed in position to form the 14,500 foot conduit system of this immense project.

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Structure & X-Ray Analysis (5b)

The Metallography of Iron and Steel. C. H. PLANT. Isaac Pitman & Sons, New York, 1933. Cloth, 5½ x 8½ inches, 221 pages. Price $3.75. A seal on the cover of this book shows that it is one of "The Specialist's Series." The contents, however, are for the beginner.

1 The purpose, according to the preface, is that "of putting forward a general survey of the theoretical metallurgy of iron and steel in its latest form in such a manner that the student, the manager, and even the practical man, can readily understand the most advanced aspects."

This is too much to hope for in 211 pages, and the beginner will get only a smattering from it. There is a too-distinct effort to write down to high-school mentality which will probably irritate even beginners, yet if one is willing to overlook this, the material gives a pretty fair introduction to the subject. An earnest student of it should end up with a fair idea of some fundamentals on carbon steel and cast iron, and an inkling that alloy steels bring up a very wide field.

2 The citations and references are chiefly British. The student would not imagine, from this book, that Germany, for example, is active in scientific metallurgy.

The book may serve a useful purpose as a primer, though not of very high rank, but offers nothing to the advanced student. H. W. Gillett (5a)-B-

Lattice Disturbances and the Röntgenographic Proof of Interior Stresses. (Gitterstörungen und der röntgenographische Nachweis von inneren Spannungen.) H. MARK & G. v. SUSICH. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Oct. 22, 1932, pages 1049-1052. Change of tensile properties in deformation of metals is accounted for in modern theories by disturbances of crystal lattice; latter is seldom without defects even in sound monocrystals. Defects can be demonstrated by reflection of the $K_{\alpha_1\alpha_2}$ doublette and measured with double X-ray spectrometer. Degree and nature of disturbance in dislocation of lattice can be calculated exactly. Methods developed by several investigators are described. Photographs 3 of disturbances are reproduced. 14 references. Ha (5b)

On Variations of Interatomic Distances with the Change from the Cubic Face Centered Arrangement to the Cubic Body Centered or to the Hexagonal Close Packed Arrangement. H. PERLITZ. *Transactions Faraday Society*, Vol. 28, June 1932, pages 514-518. The polymorphic transition from cubic face centered to cubic body centered arrangement is accompanied with a decrease of interatomic distances by about 2¼%, the variations lying between 2.8 and 1.8%. The change from the cubic close packed arrangement to the hexagonal close packed arrangement is accompanied with variations of interatomic distances which depend upon the axial ratio 4 of the hexagonal lattice and the variation is 0 for a ratio of 1.633. PRK (5b)

An X-Ray Study of Iron-Silicon Alloys Containing 0 to 15 per cent Silicon. E. R. JETTE & E. S. GREINER. *American Institute Mining & Metallurgical Engineers, Contribution* No. 8, Feb. 1933, 15 pages. Fe-Si alloys containing as much as 25 at. % Si were prepared from electrolytic Fe and Si of 99.79% purity. Powdered samples prepared from grindings were annealed at about 800° C. and the lattice parameter obtained with a focussing camera. Parameters were apparently independent of the annealing temperature. The length of the cube edge plotted against atomic % gave 2 straight lines. One from Fe at 0% Si and 2.8607 A.U. to 9.00 at. % Si and 2.8573 A.U. The 2nd from 9 at. % Si and 2.8572 A.U. to 25 at. % Si and 2.8213 A.U. The possible error in parameter was ± 0.0005 A.U. A superlattice was observed when the Si exceeded 12.5 5 atomic %. 2 hypotheses explaining the observed phenomena are given. In the first it is assumed that 2 phases are found between 0 and 25 atomic % Si, the only detected difference between these being the slope of the curve Si content-parameter. The 2nd hypothesis explains the slope of the curves on the position of the Si atoms in the lattice. Need for additional work on the low-Si alloys is pointed out. 7 references. JLG (5b)

Multiple Systems with Iron V. Roentgenographic Supplements for the Systems Cr-C and Fe-Si-P. (Ueber Mehrstoffsysteme mit Eisen. V. Roentgenographische Ergänzungen über die Systeme Cr-C and Fe-Si-P.) F. SAUERWALD, W. TESKE & G. LEMPERT. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 210, Jan. 1933, pages 21-25. Certain discrepancies which existed in the Cr-C diagram in the range from 0.9% C were investigated more thoroughly by 6 X-rays; co-existence of a stable system and a metastable system was confirmed. Stable eutectic was found at 4.24% C, the metastable at 4.51% C. The results are discussed at length with regard to the transformations taking place. 6 references. Ha (5b)

On the Corrections for Debye-Scherrer X-ray Photographs. Z. NISHIYAMA. *Kinzoku no Kenkyu* (In Japanese), Nov. 1932, pages 476-489; *Science Reports Tohoku Imperial University* (In English), Vol. 21, 1932, pages 364-384. X-ray photographs were taken by Debye-Scherrer method for specimens of varying diameters and different correction formulae for thickness of specimens such as Hadding, Pauli, Ott, Busse and Biji-Kolkmeijer-Moesveld were tested. KT (5b)

7 **Significance of X-Ray Inferences in Metallurgy. (Ueber die Bedeutung der Röntgenstrahlinferenzen für die Metallkunde.)** E. SCHMID. *Die Naturwissenschaften*, Vol. 20, July 15, 1932, pages 530-536. Physico-crystallographic studies, based on X-ray examination, are reviewed under following headings: (1) Investigation of structural arrangement of metallic systems. (2) Research on connection between atomic arrangement and properties of metals. (3) X-ray determination of texture of commercial materials. EF (5b)

The Physics of X-Rays as Basis for Röntgenographic Material Testing. (Physik der Röntgenstrahlen als grundlage röntgenographischer Materialprüfung.) W. E. SCHMID. *Archiv für Technisches Messen*, Vol. 2, Aug. 1932, section V9114-1, page T116. The principles of irradiation of materials for the determination of the fine structure of materials, of detection of defects, and of X-ray 8 spectral analysis as supplement to chemical analysis are explained. Ha (5b)

The Structure of Commercial Zinc Dust. (Über den strukturellen Aufbau von technischen Zinkstaub.) G. WASSERMANN. *Metallwirtschaft*, Vol. 12, Jan. 6, 1933, pages 1-2. Zn dust which is formed during commercial Zn distillation cannot be remelted by ordinary methods. X-ray diffraction and microscopic-examination showed that Zn dust consists of rounded particles of metallic Zn of 2 to 20μ diameter. Each particle consists of one crystal and is surrounded by a thin coating of crystalline ZnO. By analysis the dust contained 89.4% metallic Zn. It is necessary to remove the oxide coating before the dust can be remelted. CEM (5b)

Convenience and Flexibility are Features of new X-Ray Installation. *Steel*, Vol. 90, May 23, 1932, page 32. A description of the movable, shielded 9 X-ray equipment recently installed in the plant of the Sun Shipbuilding & Dry Dock Co., Chester, Pa., for inspecting welds in pressure vessels, castings, etc. JN (5b)

Röntgenographic Determination of Defects in Cast Iron. (Röntgenographische Bestimmung von Gusseisenfehlstellen.) *Die Werkzeugmaschine*, Vol. 36, Dec. 31, 1932, pages 447-450. By chemical and metallographic determinations defects were found to be due to non-metallic inclusions, but they could not be identified by these methods. It is alleged that X-ray examinations according to Debye-Scherrer method proved these inclusions to be Fe_3O_4 and FeS. Limits of applicability of X-rays for this purpose and practical application of method including results obtained are considered. 5 references. GN (5b)

10 **Precision X-Ray Methods in the Investigation of Alloys. (Präzisions-Röntgenverfahren in der Legierungsforschung.)** J. WEERTS. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft XXI, 1933, pages 75-79. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 108. (5b)

Chemistry of Alloys. (Zur Chemie der Legierungen.) A. WESTGREN. *Forschungen und Fortschritte*, Vol. 8, Jan. 1, 1932, pages 8-9. See *Metals & Alloys*, Vol. 3, Sept. 1932, page MA 267. EF (5b)

PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

The Shape of the Tensile Test Bar for Cast Iron. J. G. Pearce. *Foundry Trade Journal*, Vol. 46, May 26, 1932, pages 327, 330. Article reprinted from the *Bulletin British Cast Iron Research Association*, Vol. 3, Apr. 1932. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 322. OWE (6)

Materials Testing in Iron and Steel Foundries. (Werkstoffprüfung in der Eisen- und Stahlgiesserei.) G. Tschorn. Wilhelm Knapp, Halle (Saale), 1933. Paper, 6¼ x 9¼ inches, 196 pages. Price 13.30 RM. This is Vol. 19 of H. Hermann's "Die Betriebspraxis der Eisen-, Stahl-und Metallgiesserei.

Detailed discussion is given of methods of sampling, of chemical analysis and for mechanical testing, including calibration of testing machines and the procedure for tensile, compression, transverse, torsion, impact, bend, hardness and fatigue testing. The last is marred by the inclusion of so-called accelerated methods.

Other tests such as that for specific gravity and for magnetic properties are given in some detail. In metallography, thermal analysis is discussed, as are deep etching and sulphur printing. Microscopic examination is dealt with and equilibrium diagrams discussed in a manner to bring out the effect of the various elements in cast iron and steel.

There are tables of type compositions of ferro alloys and other raw materials, and also a tabulation of the composition and properties of many cast ferrous alloys. The pertinent D.I.N. specification sheets are given. The book covers fuels, fluxes and slags as well as metals.

It is comprehensive and useful. Besides the direct information it contains, it is of value as a concise statement of standard German testing practice.

H. W. Gillett (6)-B-

How do you test your product?

"Metallurgical Abstracts" cover the testing problems of the world.

Resonance of Rings Is no Test for Hardness. H. B. Vincent & F. A. Firestone. *Metal Progress*, Vol. 22, July 1932, pages 47-48. Slight variations in resonance frequency of vibrating roller bearing races occur with localized variations in hardness of race. Tests were made at Department of Engineering Research of University of Michigan, to determine feasibility of detecting hardness defects by measuring resonance. The change in frequency with wide variations in hardness was found to be too small to be of value as a routine test. WLC (6)

Rockwell Hardness Tester for Thin Case Hardened Layers. (Rockwell-Härteprüfer für dünne Einsatzschichten.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 8, 1933, page 26. Brief mention of the new Superficial Rockwell tester, applying testing loads of 45, 30 and 15 kg. Initial load 3 kg. Depth of indentation obtained with normal and new tester are compared. New instrument can test hardness of nitrided layers, razor blades, hoop springs and other thin pieces. GN (6)

Cohesion Strength. (Kohäsionsfestigkeit). W. Kuntze. Julius Springer, Berlin, 1932. Paper, 8½ x 12 inches, 62 pages. Price 11 RM. This book, which appears also as Sonderheft XX of the *Mitteilungen der deutschen Materialprüfungsanstalten*, is a collection of recent researches of author on cohesive strength of metals. Author states in preface that "subsequent combining of individual articles brings about many inequalities in coherence," but points out that "resulting repetition of facts may be advantageous in view of newness of field." Problems treated may properly be included under "Technological Mechanics" and are an extension of Ludwik's well known contributions in this field. Book is divided into 2 parts, development and application. In first, a very ingenious instrument is described for measuring elastic dimension changes at base of notch. It is 20 times as sensitive as ordinary Martens mirror equipment. Measurements with it show, among other things, that with small values of relative notch area, diameter at base of a circumferential V notch in a cylindrical bar increases when bar is subjected to elastic tensile stress. Among other points covered in first part are: A study of 3-dimensional stress distribution in notched tensile bars, influence of non-uniformities in stress and deformation on strength, and laws of sheer and cohesive resistance for 3 dimensional tensile stresses. There is also a discussion of "Plasticity and Strength" from original which appeared in *Zeitschrift für Physik*, Vol. 74, 1932, pages 45-65. In second part there is a thorough discussion of practical carrying out of notched tensile test with complete information on special technique necessary for preparation of notches. Original of this appeared in *Metallwirtschaft*, Vol. 11, 1932, pages 179-184 and pages 343-347. There is also a brief discussion of problem of fatigue in metals from original in *Metallwirtschaft*, Vol. 10, 1931, pages 895-897. This is followed by a full treatment of significance and application of results of notched tensile tests. General method employed by Kuntze for determination of cohesive strength is to make static tensile tests on round test bars that have a V-shaped circumferential notch. Notch is used to restrict deformation because otherwise properties of ductile material may be altered by cold working prior to fracture and cohesive strength at rupture is greatly changed from that of original condition. Determination of changes in elastic transverse dimensions at base of notch shows for a limiting case a notch angle, 0°, and a depth reaching to axis of bar, that a condition of multi-directional equal tension is attained. Author discusses influence of non-uniformity of stress on strength values obtained by dividing maximum load by (original) area at base of notch. With proper conditions, strength values, so determined, lie on a straight line when plotted against relative notch area (ratio of cross sectional area at base of notch to cross sectional area of bar) and it is possible to extrapolate to a relative notch area of zero. This must be corrected by extrapolating to a notch angle of 0°. A method is given for making these determinations by testing only 2 specimens: (1) Regular tensile specimen which gives usual tensile strength σ_B; and (2), a notched specimen of following dimensions: notch diameter (d) = 3 mm., bar diameter (D) = 10 mm., relative notch area (k) = 0.09, notch angle (w) = 135°, radius of point (r) = 0.1 to 0.15 mm. Test on this specimen gives strength value σ (wk) which together with σ_B is substituted in following formula to give cohesive strength (Trennfestigkeit) S_T:

$$S_T = \sigma_{w=0,\ k=0} = \sigma_B + \frac{\sigma_{wk} - \sigma_B}{1 - k} \cdot \frac{180}{180 - w}$$

While development of this type of tensile testing is not highly mathematical, it is theoretical in nature and does not seem to have attracted much attention in America. Author believes that results of standard tensile test are a function of dimensions and shape of specimen used and that notched tensile test gives a factor which is truly characteristic of material itself. Value of this factor in engineering design can be ascertained only by actual trial and this collection of articles and previous ones on same subject by Dr. Kuntze is recommended to testing engineers and designers for careful study. Of 88 references cited all except 3 are to German publications.

R. L. Kenyon (6)-B-

Variation in Tensile Properties. (Ueber die Unschärfe der Festigkeitsgrenzen.) Adolf Smekal. *Metallwirtschaft*, Vol. 11, Oct. 7, 1932, pages 551-554; Oct. 14, 1932, pages 565-567. An attempt was made to determine the reason for the variation in tensile properties of materials of identical composition and preliminary treatment. In order to prevent the effect of heating on deformation, single crystals of NaCl, KCl, KBr and KI were used as samples instead of metals, and the effect of stress was observed through polarized light. The yield point checks very closely in all tests while the maximum stress varies considerably. The variations are not accidental, but the results are concentrated in several groups. This is explained by the relation between the direction of the applied stress and the position of the slip planes in the crystals. To obtain conditions of deformation similar to those of metals stressed at room temperature it would be necessary to test the salt crystals at about 600° C. 18 references. CEM (6)

Comparison of Two Types of Test-bars for Resilience Tests. (Confronto fra due tipi di barrette per prove di resilienza.) C. Teodoresco. *La Metallurgia Italiana*, Vol. 25, Jan. 1933, pages 1-11. Discussion of precision of data presented by A. Steccanella (*La Metallurgia Italiana*, Vol. 24, May 1932.) In previous paper, test bars of Mesnager type (10 × 10 × 55 mm.) with a groove 2 mm. deep, were compared with those having a 3 mm. groove. Bars with 2 mm. groove, are considered to give more precise results. AWC (6)

Measuring Movements of 0.000001 Inch. *Electric Journal*, Vol. 29, Aug. 1932, pages 380-382. The most minute displacements are measured by a magnetic strain gage, a small cylindrical device about 4" long. With an oscillograph it is valuable to record movements under changing conditions. Stress in rails under impacts of a locomotive, and the strain in driving rods have been measured. CBJ (6)

On the Effect of Torsion on the Density, Dimensions and Electrical Resistance of Metals. T. Ueda. *Kinzoku no Kenkyu*, Japan, Oct. 1932, pages 417-446; *Science Reports Tohoku Imperial University*, Vol. 21, July 1932, pages 193-230 (In English). Changes of density, dimensions and electrical resistance in Armco Fe, Swedish steel, brass, Ni and Cu, when twisted by a torsion testing machine, were measured. Dimensions of test piece were 8 mm. in diameter and 200 mm. in gage length for Fe and steel; 7 mm. in diameter and 200 mm. in gage length for brass, Cu and Ni. Results obtained are as follows: In Armco Fe and steel, density decreases with increasing twist, and rate of decrease is considerable up to yield point and small afterward. As C content increases, rate of change increases. Test piece elongates with angle of torsion; at beginning of twist elongation is small, but above yield point, it increases abruptly. Sectional area decreases similarly to change of density. In brass, density varies almost proportionally to angle of twist, and rate of decrease is considerably larger. Elongation is also very large and change is similar to that of density, but change of sectional area is very small, decreasing with angle of twist. Density of Ni decreases abruptly at beginning of twist, but beyond 2°/cm. of specific angle of torsion, rate of change becomes small. Test-piece elongates similarly to change of density in magnitude and sectional area slightly decreases with twisting angle. Changes of density, length and sectional area of Cu are all small as compared with metals above mentioned, and corresponding curves are nearly straight. Changes of electrical resistance and specific resistance of Armco Fe and steel increase rapidly with increase of twisting angle up to yield point, and afterward rate of increase becomes considerably less. This change is similar to that of shearing stress. In case of Cu and brass, electrical resistance and specific resistance increase continuously with twisting angle and curves have an inflection point at 17°/cm. of twisting angle. Electrical resistance of Ni increases at first considerably and then gradually and tends to an asymptotic value, as angle of twist increases. KT (6)

The Testing of Castings. Walter Rosenhain. *American Metal Market*, Vol. 39, Aug. 20, 1932, pages 6-7; Aug. 23, 1932, page 10. Paper presented before the Institute of Metals, Mar. 1932. See *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 322. DTR (6)

Measurement of Elongation in Bending Tests (Messung der Dehnung bei Biegversuchen). L. V. Roessler. *Die Schmelzschweissung*, Vol. 11, Nov. 1932, pages 242. Describes a lever gage from which the arc and its height can be read from which the elongation is then calculated by a simple formula which is given. Ha (6)

Elasticity, Plasticity, Toughness, Brittleness and Hardness. (Elastizität, Plastizität, Zähigkeit, Sprödigkeit und Härte). M. Ros & A. Eichinger. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 530-543. Definition and explanation of the terms in respect to type of deformation and rupture. 12 references. HWG (6)

Damping Measurements on Oscillating Rods. (Dämpfungsmessungen an schwingenden Stahlstäben) Danwart Schenk. *Zeitschrift für Physik*, Vol. 72, Oct. 1931, pages 54-67. A method of measurement of longitudinal amplitude of steel rods by the use of peizoelectric quartz plates. Measurements performed by this method show that the damping changes with change in amplitude. The behavior of the damping depends upon the crystal structure of the rod, as shown by X-ray analysis. In the case of the 2 rods investigated, their oscillating capacity was lost after prolonged treatment. JGT (6)

Material Investigations on the Baaken Bridge in Hamburg. (Werkstoffuntersuchungen an der Hamburger Baakenbrücke.) A. Pomp. *Der Stahlbau*, Vol. 5, Dec. 9, 1932, pages 193-195. Results of (1) chemical analysis, (2) mechanical tests on tensile strength, notch toughness, endurance bending tests and folding tests, (3) microscopic examination of material used, are given. Results show that material of bridge is still in good condition after 35 years of service. Bridge is remarkable in that it is first German bridge built of Thomas steel. GN (6)

Comparative Tests of Hardened Steel by Means of Penetration Testing Apparatus. N. N. Sawin & E. Stachrowski. *Transactions American Society for Steel Treating*, Vol. 20, Sept. 1932, pages 249-262. Authors describe Vickers, Rockwell and Monotron hardness testing machines and discuss their application to testing of hardened steel. Conversion curves are given. Authors found that Vickers machine is well adapted for laboratory tests especially where shape is complicated, Rockwell machine is indicated for use where shape is simple and production testing is done, Monotron is of advantage where testing is on a production basis and state of the surface must be studied. 19 references. WLC (6)

Light Metal Sand Castings, Static and Dynamic Strength. (Leichtmetall-Sandguss, seine statische und seine Schwingungs-Festigkeit.) W. Saran. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 207-210. Continuation of earlier article (*Zeitschrift für Metallkunde*, Vol. 24, 1932, pages 181-184). This chapter adds new data on bending and torsion fatigue. Fatigue strength values with differing types of loading are compared. Fatigue properties of alloys studied are not greatly different though alloys differ considerably in composition. It is not possible to predict fatigue strengths from static tensile properties. Age-hardening in these alloys does not affect fatigue strength though increasing static tensile strength greatly. RFM (6)

Additional Bending Stresses in Double C Profile Joints. (Zusätzliche Biegespannungen bei Doppel C Profilanschlüssen.) B. von Schlippe. *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, Vol. 23, Nov. 14, 1932, pages 625-627. In riveted joints of large profiles losses in strength are observed. In numerous cases investigations showed this to be due to additional bending stresses. Author determined by calculation and experiment effect of additional bending stresses in a double C joint. Thin walled C profiles were riveted on web. Course of stresses was determined by extension measurements with a Huggenberger tensometer. Stresses measured and calculated were in satisfactory accord. GN (6)

Elasticity and Plasticity, Tenacity and Fragility (Elastizität und Plastizität, Zähigkeit und Sprödigkeit). G. Sachs. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 548-554. Definitions and brief discussion. 19 references. HWG (6)

Effect of Diameter and Distance between Bending Rolls on the Results of Deflection Tests of Welded Samples. (Einfluss von Durchmesser und Abstand der Biegerollen auf die Ergebnisse der Biegeprobe bei geschweisstem Proben.) KARL LUDWIG ZEYEN. *Stahl und Eisen*, Vol. 52, Sept. 8, 1932, pages 879-880. Report 186 of Committee on Materials of Verein deutscher Eisenhüttenleute. 37 low C steel sheets, 6 mm. thick, containing 0.11% C, 0.55% Mn, 0.01% P, 0.02% S, and a trace of Si, were welded with bare electrodes. From these welded sheets test pieces 50 mm. wide were prepared, edge on bottom of weld seam being trimmed off evenly. A portion of samples were tested with weld intact, while a 2nd portion had weld strip worked down to sheet thickness. In deflection tests, diameters of bend rolls were 70, 100, and 130 mm. and distances between rolls were 30, 50, and 70 mm. Results indicate that these 2 factors have considerable influence on deflection angle attainable. Bend angle varies almost directly with diameter and roll interval. DTR (6)

Non-Destructive Testing Methods in the Iron and Steel Industry. ROBERT F. MEHL. *Yearbook American Iron & Steel Institute*, 1932, pages 126-184; *Heat Treating & Forging*, Vol. 18, July 1932, pages 412-414; *Engineering*, Vol. 134, Aug. 19, 1932, page 228. Non-destructive testing methods are classified as magnetic (including those often described as electric or electromagnetic), radiographic and sonic. Much of application of these methods depends upon detection of some heterogeneity in a field of flux, whether that flux be electric, magnetic, actinic, or sonic—whether that field be that of the passage of an electric current, a magnetic field, a penetrating light ray (X-rays or gamma rays), or a sound wave. The 2 most important applications of magnetic direct current methods are (1) method developed by Burrows and Capp for inspection of turbine bucket wheels and (2) method developed by Sperry Products Co. primarily for detection of fissures in rails. Alternating current methods are quite numerous. Application of Fe powders to detection of surface defects is also covered. Radiographic methods are covered in considerable detail with numerous illustrations. 45 references. VVK (6)

An Automatic Autographic Extensometer for use in Tension Tests of Materials. R. L. TEMPLIN. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 783-792. Automatic autographic extensometer for determining yield strength of materials in routine tension is described. Instrument provides a means of obtaining load-strain curves at strain magnifications varying from about 400 to about 16,000. For commercial routine tests magnifications of 400 or 800 are used, and yield strengths can be obtained with an accuracy comparable to usual values for ultimate tension strength. It can also be used for compression tests without modification. Typical load-strain curves are reproduced. VVK (6)

The Yield Point at Obstructed Deformation. Its Significance for the Fatigue Strength Diagram. (Die Fliessgrenze bei behinderter Formänderung. Ihre Bedeutung für das Dauerfestigkeits-Schaubild.) A. THUM & F. WUNDERLICH. *Forschung, Zeitschrift Technische Mechanik und Thermodynamik*, Vol. 3, Nov.-Dec. 1932, pages 261-270. Upper load limits for construction are determined by 2 factors, (1) curve of fatigue limits and (2) yield point. Yield point is no definite value but depends on type of loading for each material. Bending, tensile and compression tests on notched and unnotched samples show that material yields more at higher stresses than in common tensile test when load on a cross-section is not uniform because of obstruction of deformation in less loaded areas. Thus, even in common transverse test on smooth unnotched samples yield point is higher than in tension. Yield point in bending is merely dependent on cross-sectional form and is the higher the more material is concentrated about neutral axis. Fatigue limit in bending is higher than in tension. In torsion tests effect of non-uniform stress distribution on yield point was also observed. Notch effect was studied on flat and round bars. With V-notches stress maximum may attain a multiple of yield point of common tension bar before material yields in notch base. Whole cross-section of notch flows in flat bars when mean load on cross-section has become equal to yield point in tension. In round bars with sufficiently sharp notches triple axial state of stress prevails effecting a still stronger obstruction to deformation than double axial state of stress. These results show that previous theories on yield point at non-uniform stress distribution do not hold true. Cause of this deviation evidently is in tendency of material to flow in layers. 25 references. GN (6)

Basis of a New Science of Construction. (Die werkstofftechnischen Grundlagen einer neuen Konstruktionslehre.) A. THUM. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 25-36. Paper presented at 25th Anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. Discusses at length inaccuracies involved in using safety factors suggested by Bach for calculation of constructions. Whereas Bach uses and builders still use a ratio for permissible static load to repeated load to alternating load of 1: 2/3: 1/3 results of fatigue tests show a ratio of approx. 1: 4/5: ½. However, even this ratio does not hold true for particularly stressed elements of constructions. For bolts, for instance, this ratio should be 1: 1/8: 1/15. It should be emphasized, however, that Bach established above ratio only for mean conditions in machine construction and author, therefore, cautions against a sometimes rather arbitrary change of this ratio. The reasons why the builder needs such safety factors are: (1) lack of accurate tensile data of materials and (2) inadequacies of common methods of calculating tensile properties. Latter point is especially important when notch effects are present in shock and repeated loading. New proposals to better specify safety factor in taking account of such conditions are dealt with. Author develops a system which introduces determination of actual stress distribution in endangered cross-section. Difference of this new method of calculation, as contrasted with former, lies in possibility of basing calculation on determined tensile properties after effective stress maximum occurring in construction has been accurately determined. By this method builder makes his constructions in best possible way. GN (6)

On the Relation existing between Elasticity, Plasticity, Toughness and Brittleness. Suggestion for a Measure of Toughness under Static Load. (Begriffliche Beziehung zwischen Elastizität, Plastizität, Zähigkeit und Sprödigkeit. Vorschlag eines Zähigkeitsmasses bei statischer Beanspruchung). P. THEODORIDES. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 567-570. Definitions. Static toughness is expressible in terms of the area under the stress-strain diagram. HWG (6)

Does Nickel Show a Positive Elongation in the Joule Magnetostrictive Effect? S. R. WILLIAMS. *Physical Review*, Vol. 41, July, 1932, pages 251-253. Question as to whether there is a positive Joule magnetostrictive effect in Ni has once more arisen. It is pointed out that there is no positive elongation unless a remanent magnetism or an extraneous field is present to give sample of Ni a preliminary magnetization before main field is applied. Even then, there is no positive elongation unless preliminary magnetization is opposed to that of main field. WAT (6)

Fundamental and Practical (test) Connection between Elasticity and Plasticity, Tenacity and Brittleness. (Begriffliche und prüfmethodische Beziehung zwischen Elastizität und Plastizität, Zähigkeit und Sprödigkeit). A. SCHOB. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 560-566. Definitions and brief discussion. HWG (6)

Magnetic Properties. Report of A.S.T.M. Committee A-6, THOMAS SPOONER, Chairman. *Preprint* No. 14, June 1932, *American Society for Testing Materials*, 15 pages. Most important activity of committee during year consisted in a complete revision of Standard Methods of Test for Magnetic Properties of Iron and Steel (A 34-28). Proposed changes are in general a modification in arrangement, a substitution of more accurate definitions for principal magnetic terms used in magnetic testing, and more complete recommendations with reference to accuracy and suitability of various types of available magnetic testing equipment. VVK (6)

Study on the Unification of Acceptance Test Specifications for Cast Iron Castings. (Etude sur l'Unification des Cahiers des Charges concernant les Fontes Moulées). Scientific Committee, Belgian Foundry Association. *La Fonderie Belge*, Vol. 2, June 1932, pages 94-100. (1) Test bars of large size: (a) Tensile test: test bar of circular section cast separately is advocated. Middle part of bar is a cylinder of 30 mm. diameter and 40 mm. length: 2 ends of bar have a diameter of 45 mm. and middle part is joined to ends by means of a cone of 60 mm. length. Casting condition must be thoroughly controlled. (b) Transverse test: Bar of 30 mm. diameter should be tested in as cast condition with 600 mm. between supports. (c) Impact test: Researches are in progress. Square bar of 40× 40 mm. should be tested in as cast condition with 160 mm. between supports. (d) Hardness testing: ball of 5 mm. diameter under 500 kg. load should be preferred to ball of 10 mm. under 3000 kg. load because latter cannot be applied to thin castings (e) Crushing test: This test is difficult to perform correctly and is not advocated for cast Fe. (2) Testing on small bars: Large bars, cast separately qualify only the metal whereas small bars which can be cut from castings qualify the castings. Transverse test on small size bar is very interesting for controlling high test cast Fe castings but must be performed on very accurate testing machines. It gives breaking load deflection corresponding to breaking work (Product of breaking load by deflection). Accuracy of results with small size bars is as good as that with larger ones. FR (6)

Ideal and Practical (test) Relation between Elasticity, Plasticity, Tenacity and Brittleness. F. B. SEELY. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 555-559. Definitions and brief discussion. HWG (6)

Some Properties of Several Alloy Steels against Impact. Part I. Force-Deformation Curves in Impact Bending Test. KAJIMA MUROI. *Tetsu to Hagane*, Vol. 18, Sept. 1932, pages 922-941. According to force-deformation curves obtained from impact bending test, it may be inferred that even with 2 specimens of the same impact value, one may have a comparatively large force with a correspondingly little ultimate deformation and vice versa. From this point of view, force-deformation curves of 8 alloy steels, such as Ni-Cr-, high Mn-, high Ni-, and stainless steels, in various heat treated conditions were obtained. Following conclusions were obtained: Large impact values are generally combined with large ultimate deformations, but for a definite impact value there are considerable differences in value of ultimate deformation. When impact value is comparatively small maximum force increases generally with it; when impact value becomes greater maximum force decreases with it. Similar to previous case, for a definite impact value, maximum force differed greatly. No general relations were found between maximum force and Brinell hardness number. TS (6)

Testing and Measurement of Welded Joints in Steel Structures. (Zur Prüfung und Messung von Schweissverbindungen für Stahlhochbauten.) R. CAJAR. *Elektroschweissung*, Vol. 3, Oct. 1932, pages 196-197. Shows in an example that mechanically testing weld seams permits no conclusion on bearing strength of structure. Opinions as to effect of certain welding faults are divergent; standardization of testing methods is suggested. Direct measurement of stresses with extensometers offers great difficulties and, therefore, is not yet much in use. Methods for measuring thicknesses of weld seams and inaccuracies involved are discussed. Cross-section can be determined accurately only on flush seams. GN (6)

Elongation Measurements and Bending Tests. (Dehnungsmessung und Biegeproben.) C. F. KEEL. *Zeitschrift für Schweisstechnik*, Vol. 22, July 1932, pages 189-190. The writer states that the elongation determination of the standard tensile testing method should not be applied to welded seams and advocates his former suggestion to employ bending tests instead. Formulae for calculating the bending number are given. EF (6)

Shear Test for Cast Iron. (L'Essai de Cisaillement pour la Fonte.) H. H. JUDSON. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, June 1932, pages 210-212. Translation of a paper before the American Society for Testing Materials, Vol. 31, Part 2, 1931, pages 304-316. See *Metals & Alloys*, Vol. 3, May 1932, page MA 127. FR (6)

Percent Elongation in the Tensile Test as a Method of Measuring the Ductility of Thin Sheets. REID L. KENYON. *Metals & Alloys*, Vol. 3, Oct. 1932, pages 220-225, 232. Briefly discusses previous work on conversion factors for relating values for elongation on specimens of thin sheet having different gage lengths and sizes. Describes work carried out on 19 gage sheet of low C steel carefully selected for its uniformity to establish the effects, (1) speed of testing, (2) proximity of shoulders to measured gage length on elongation, (3) various methods of measuring elongation and reduction and effect of gage length upon these qualities, (4) determination of elongation correction factors for specimens of different thickness but equal length and width. Increased speed of testing was found to reduce the elongation definitely. Ratio of elongation in 2″ vs 4″ was found to decrease with increasing speed of testing. Length of parallel section appears to have no effect upon elongation. Uniform elongation can be measured from accurate stress-strain curves. Gage length is without effect upon reduction of area. Percentage total elongation is a function of gage length and cross section which may be expressed as a "slenderness ratio" L $\sqrt{A}$. This relationship may be used to compare percentage total elongation on samples of same section and varying gage length or samples of same length and varying section. Factors applicable to mild steel sheets have been determined but their use requires adoption of a standard thickness. WLC (6)

Note on the Use of a New Hardness Ratio. H. S. KIPLING. *Journal Institution of Automobile Engineers*, Oct. 1932, pages 68-69. Author concludes from a series of tests in which hardness was determined by ball Brinell method and by diamond Brinell method that ratio of the 2 readings can give valuable information on nature and heat treatment of a steel. Figures obtained in case-hardened steels seem to support his statements; it appears that any range of ball hardness from 120 to 350 with a diamond/ball ratio exceeding 1.2 indicates heat treatment. Further investigation is recommended. Ha (6)

Natural Stresses in Large Forgings. (Eigenspannungen in grossen Schmiedestücken.) G. KIRCHBERG. *Forschung, Zeitschrift Technische Mechanik und Thermodynamik*, Vol. 3, Nov.-Dec. 1932, page 312. Abstract of research report No. 357 of Verein deutscher Ingenieure. States of stress of 2 cylindrical, hardened and drawn forgings were determined. The forgings were cut in rings; from the changes of shape occurring conclusions were drawn as to the stresses. One test sample was provided with a bore. Changes in length on inside of rings were determined by means of a horizontal comparator; changes in shape of the outside were also measured. After calculating the states of stress of rings from the changes of shape measured it is shown how natural stresses of samples are arrived at. Equations required are derived, check methods are given. Natural stresses of forgings are discussed. Principal result is that largest stresses in heat treated cylindrical forgings occur in direction of body axis. Natural stresses can be considerably decreased by providing forging with a bore before heat treating. GN (6)

Experiments of Committee on Electric Welding of the Ukrainian Academy of Science in Kiew. (Versuche des Komitees für Elektroschweissung der Ukrainischen Akademie der Wissenschaft in Kiew.) MÜLLENHOFF. *Schweizerische Technische Zeitschrift*, Vol. 30, Jan. 6, 1933, page 6. Brief account of results of tensile tests on welded flat steel bars. Samples with seams vertical to direction of pulling generally failed in seam. When seam possessed an angle of 50°-55° to direction of pulling samples generally cracked in one of ends of bar, but rarely in seam. GN (6)

Fatigue of Metals & Alloys (6f)

Corrosion-fatigue of Metals. H. J. Gough. *Journal Institute of Metals,* Vol. 49, 1932, pages 17-92; *Metal Industry,* London, Vol. 41, Sept. 16, 1932, pages 275-277; Sept. 23, 1932, pages 295-298; Sept. 30, 1932, pages 319-322; Oct. 7, 1932, pages 349-350. Eleventh Autumn Lecture, delivered Sept. 12, 1932. A general survey of the subject in which practically all phases are discussed. The first published report on the subject was by Haigh in 1917, but further research was not reported until 1926. Since that time extensive work has been reported by McAdams in America and by various English investigators. A number of service corrosion-fatigue fractures are shown, and the difference between this type of failure, where cracks start from many points, and other fatigue failures are pointed out. There is considerable doubt whether a real corrosion-endurance limit exists, as for many conditions the S-N curves do not become horizontal even after many million cycles. The mechanism of corrosion-fatigue is discussed, but a complete theory could not be formulated. The character of the surface film formed by the corrosion is of extreme importance. A film that affords excellent protection on parts not subjected to cyclic stress may offer little resistance to corrosion-fatigue due to its cracking when deformed. 52 references. See *Metals & Alloys,* Vol. 4, Mar. 1933, page 39 for critical abstract. Ha + JLG (6f)

Endurance Tests of Riveted Joints. (Dauerversuche mit Nietverbindung aus St. 37 zur Erkundung des Einflusses von $\delta : \tau$.) Otto Graf. *Der Bauingenieur,* Vol. 15, Ju. 15, 1932, pages 389-393. In continuing former investigations on structural steels (See *Metals & Alloys,* Vol. 3, July 1932, page MA 210) the "original tensile strength" (strength under repeated stress in tension) was determined on rivet joints and the steels used. Joints with 1- 2 and 3 rivets in the lap, plate St. 37/ rivet St. 34 and plate St. 52/ rivet St. 52 were tested, 350 blows/min. Original strength is defined as that endured at 2 million cycles. Samples comprise 3 groups, plate thicknesses 12, 14 and 16 mm., ratio tension stress (δ) to shear stress (τ) 1: .93, 1:1.08, 1:1.24. Following determinations were made: common tensile strength, strength under repeated stress in tension of flat specimens with rolling skin and bored with hole (initial load .5 kg./mm.^{2}), static tensile strength of riveted joint, measurements of elastic and plastic elongations in tensile tests with stepwise loading, resistivity of rivet joints under repeated stress. The main results are: Resistance to slip in rivet joint may considerably affect original strength of joint. Strain in rivets also has a bearing. The ratio $\delta : \tau$ is of considerable influence. For resistive capacity of rivets against shear in common tensile tests τ_{max} is decisive factor. Occurrence of fracture at repeated stress shows considerable deviation from that in common tensile tests. Under testing conditions it is advisable to choose the ratio $\tau : \delta$ not above 1 when properties of the materials are to be fully utilized. In dimensioning rivets of joints to be subjected to repeated stresses not only shear but also the bending stresses have to be borne in mind. 8 references. GN (6f)

On the Endurance Strength of Steel. (Beitrag zur Drehschwingungsfestigkeit von Flussstahl.) Otto Gerbes. Doctor thesis, Technische Hochschule Danzig, 26 pages. *Zeitschrift Verein deutscher Ingenieure,* Vol. 75, July 25, 1931, pages 972-973. Investigation was undertaken to elucidate causes of fatigue failures. Test comprises determination of fatigue limit of (1) various C and alloy tool steels, (2) non-welded and welded samples (gas welding, Arcatom welding and electric resistance welding) of structural C steels St. 37.11 and 60.11. M. A. N. fatigue testing machine which had to be modified in some respects was used for tests. Results show: (1) fatigue limit of hardened and not drawn steels is independent of tensile strength and practically alike regardless of composition. This result and fluctuations of data go to show that fatigue limit of hardened steels is chiefly affected by hardening stresses and cracks thus caused. For non-hardened steels grain size is decisive factor. (2) Decrease of fatigue limit of all welded samples is rather uniform. For welded St. 37.11 samples fatigue limit decreased by from 8-14%, for welded St. 60.11 samples by from 22-49%. These tests on welded steels show that fatigue limit strongly decreases with increasing grain size. (3) Also on non-welded samples of steels of group (2) fatigue limit decreases with increasing grain size. 11 references. GN (6f)

Increase of Fatigue Limit of Bolts by Suitable Dimensions and Machining. (Erhöhung der Dauerfestigkeit von Schrauben durch zweckmässige Formgebung und Fertigung.) F. Debus. *Schriften der Hessischen Hochschulen,* 1932. No. 4, pages 68-73. Paper presented at 25th anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. An account is given of extensive tests on above problem. Since these tests were undertaken in an entirely new field, a simplification was first necessary in that bolts were first tested which were not subjected to initial loads. Tests aimed at an improvement of fatigue properties of bolts, i.e., conditions for attaining maximum fatigue resistance were studied; they refer to (1) influence of shape, (2) influence of production and heat treatment, (3) influence of material. (1) By increasing free thread length and by reducing shaft diameter (even below that of core diameter) a considerable improvement was attained. Even slightest increase of fillet radius in thread base brings about a considerable increase of fatigue strength. (2) Rolled threads are much superior to cut threads; endurance impact strength was about 6 times higher for rolled threads. Heat treatment has a considerable bearing on impact strength. (3) Comparative tests on various materials show a tendency toward increased impact strength with increasing tensile strength. Tests on bolts under initial stresses which are in progress indicate great importance of initial stress for protection of bolts. It is hoped that it finally will be possible to control absolutely initial stresses and to eliminate effects of actual loads on initial stresses and thus reduce bolt failures to a minimum. GN (6f)

Bending and Endurance Bending Tests on Thin Walled Steel Tubes Welded by the Arcatom Method. (Biege- und Dauerbiegeversuche an dünnwandigen, nach dem Arcatomverfahren geschweissten Stahlrohren.) H. W. Franke. *Elektroschweissung,* Vol. 3, Nov. 1932, pages 206-207. Results of static and endurance bending tests on butt welded commercial steel tubes with a wall thickness of from .5-.75 mm. are reported. Comparative tests were made on cold drawn and on annealed tubes. Endurance bending tests were performed in an especially designed machine which is described. Endurance limit was found at about 17 kg./mm.^{2}. Nearly all tubes cracked near weld seams which proves that seams meet requirements. GN (6f)

Tension-Compression Endurance Tests with Low Frequency of Change of Load Direction. (Zug- Druck-Dauerversuche mit niedriger Frequenz der Kraftrichtungswechsel.) Dörnen. *Der Stahlbau,* supplement to *Bautechnik,* Vol. 5, Oct. 14, 1932, pages 161-163. In order to determine safety which various structural steels and weld seams on those steels, calculated with permissible stresses, offer against alternating loads following tests were made: (1) Determination of number of load changes on bored St. 37 plates, loaded with a calculated load of $\pm$ 1400 kg./cm.^{2} in weakened cross-section till first hair cracks appear. (2) Similar tests on St. 52, but load increased by 50%, i.e. to 2100 kg./cm.^{2} (3) Tests on St. 37 plates provided with X-notches similar to round holes under (1), but these notches welded. (4) Tests similar to (3) but angle of X-notches increased. Tests were made with a specially designed machine. Results go to show that St. 52 at stresses by 50% higher than for St. 37 guarantees same safety as St. 37 at lower load. GN (6f)

Surface Working and Influence of Transverse Holes on Fatigue Resistance. H. W. Gillett. *Metals & Alloys,* Vol. 2, Feb. 1931, pages 94-95. Extended abstract of article by H. Döring. Effect of transverse holes on endurance properties of bronze, Cu, Cu-Al-Si alloy, cast Fe, C steel, Ni-Cr, Ni-Cr-Mo, Cr-V, Ni-Cr, W, Mo steels is discussed. WLC (6f)

Fatigue of Shafts having Keyways. R. E. Peterson. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 413-420. Rotating-beam tests are reported on specimens of medium C steel normalized and Cr-Ni steel heat treated. The specimens were of 3 kinds, (1) specimens without keyways, (2) specimens with "sled runner" keyways, cut with an ordinary milling cutter, and (3) specimens with "profiled" keyways, cut with an end mill with a diameter the width of the keyway. The data given are in terms of "stress concentration factor," which is defined as $\frac{\text{ordinary endurance limit}}{\text{endurance limit with keyway}}$. The stress-concentrations, based on net section of specimen were found to be as follows:

	Chrome-nickel steel heat treated	Medium-carbon steel normalized
Specimens with sled-runner keyway	1.35	1.11
Profiled keyway	1.74	1.35
Specimens with transverse hole	.....	1.76

These tests were tests under reversed flexure. The author discusses the probable relative effect of keyways in shafts subjected to alternating torsion, and quotes work of Ludwik to show that the same ratios might be expected as for the case of reversed flexure. VVK + HFM (6f)

What is this thing called Fatigue?

These abstracts are prepared in cooperation with the A. S. T. M. Research Committee on Fatigue of Metals.

Adhesion and Fatigue of Thin Castings of White Metal on Mild Steel Surfaces. *Engineer,* Vol. 153, Feb. 19, 1932, page 205. Brief review of investigation carried out by Sir Thomas Stanton at the National Physical Laboratory. Results have been recently published for the Aeronautical Research Committee by His Majesty's Stationery Office. LFM (6f)

Discussion on Fatigue Testing. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 304-328. Comments were made on engineering application of facts brought out by fatigue testing and the necessity for resistance to the notch effect in practical applications. Published work (abstracted in *Metals & Alloys* as it appeared) was reviewed by several speakers. H. A. Dickie discussed effect of internal stress, pointing out that the presence of a decarburized layer on a hard steel tends to produce tension in the outer layer which is added to imposed stress to produce actual stress. HWG (6f)

The Present State of Knowledge of Fatigue of Metals. H. J. Gough. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 207-227. Perhaps as good a concise summary as has appeared to date. Its very conciseness makes abstracting practically impossible. 71 references. HWG (6f)

Breakage of Rolls. Frederic Bacon. *Blast Furnace & Steel Plant,* Vol. 20, May 1932, page 448; June 1932, page 538; July 1932, page 608. Conclusions from author's paper "Fatigue Stresses with Special Reference to the Breakage of Rolls," read before South Wales Institute of Engineers, Nov. 18, 1930. See *Metals & Alloys,* Vol. 2, Apr. 1931, page 80. MS (6f)

Fatigue. (Ermüdung). P. Ludwik. *International Association for Testing Materials, Zurich Meeting, 1931,* Vol. 1, 1932, pages 190-206. General discussion, with tabulation of much previously published data. Temperature rise, as a measure of damping, is plotted against number of cycles, for 8 annealed C steels from 0.03% to 1.1% C, each under the load corresponding to its endurance limit. No relation is shown with the endurance limit. Corrosion-fatigue is discussed. The ratio between endurance limit in repeated torsion and in rotary bending was found to be about 0.575 for a wide range of ferrous and non-ferrous alloys, but the ratio did not hold for cast Fe, in which it was 0.93. The 0.575 ratio held even for notched specimens (cast Fe not tested notched). Accelerated tests are discussed and found useless. 37 references. HWG (6f)

Fatigue Strength and Construction. (Dauerfestigkeit und Konstruktion.) A. Thum & W. Buchmann. VDI Verlag, Berlin, 1932. Paper, 6 x 9 inches, 81 pages. Price 6.80 RM. Nearly all fractures occurring in machine construction are endurance cracks, caused by repeated or alternating stresses. In spite of this, most designs are based upon results which determine the strength of a sample by a singular increase of loading, as for instance, in the tensile test. The research in metals has brought about a lot of experiences in the field of fatigue, that clearly show that the conventional conceptions and fundamentals of design are not valid. These experiences of late researches are so scattered, however, that a comprehensive survey cannot be expected from all designers. In all problems connected with the endurance of materials, nothing is gained by the knowledge of part of the facts, say of the fatigue data, for a useful application. On the contrary, the simple application of results from fatigue tests may become dangerous when the necessary knowledge of the exact determination of the occurring stresses and the manifold influences on the fatigue properties is missing. On account of these difficulties, an attempt is made by the authors to collect and to summarize critically all available data. Such information is badly needed for an intelligent choice of material, for good fashioning and calculating. The authors discuss the present state of research giving a short historical survey. The contents of the book are: Danger of failure; appearance of the fracture at different loads; fatigue strength as a property of building materials; influence of the shape on the fatigue strength and the right application of fatigue strength data. It contains a detailed discussion of the principles of the various machines for testing the endurance of materials including the recent designs for carrying out compound tension-compression-bending tests. There are the chapters on the influence of heat-treatment and of cold-working on the endurance limit, and endurance at elevated temperatures. Endurance strength with simultaneous corrosive attacks is discussed. There are directions for the choice of materials and for proper shaping from the point of view of endurance. The book is the first of a series on the fatigue of metals. Being the introductory book it formulates a set of standard expressions to be used, since there is no uniformity in the nomenclature as yet. This is another fact to render the book most valuable to the foreign reader. Georg Goldbach (6f)-B-

Endurance Tests on Electric Arc Welds. Dimensions and Arrangement of Vee Seams. Measurement of Stresses on Weld Seams. (Aus Dauerversuchen mit Lichtbogen schweissungen. Ein Beitrag zur Frage der Bemessung und Anordnung der Kellnähte. Messung von Spannungen in Schweissverbindungen.) Otto Graf. *Der Stahlbau,* supplement to *Bautechnik,* Vol. 5, Nov. 11, 1932, pages 177-182. Describes static and dynamic tensile tests on Vee seams of variable length. Joints with short, thick seam show a higher endurance strength than the long, thin ones. Fracture of joint in endurance tests occurred close to the seam. Cases of fracture are discussed at length. Similar tests were made on seams of variable thickness. Results of stress measurements on joints as caused by shrinkage of seams of various types and thicknesses are described. Elastic changes in length and, therefore, stresses on the edges of flat Fe bar joints proved to be smaller in gas welding than in electric arc welding. GN (6f)

ELECTRO-CHEMISTRY (7)

Technical Electrolysis of Aqueous Solutions. (Die technische Elektrolyse wässeriger Lösungen.) J. Billiter, F. Fuchs & G. Pfleiderer. Akademische Verlagsgesellschaft, Leipzig, 1933. Cloth, 7x9¾ inches, 451 pages. Price 44 RM.
This is part 1 (inorganic) of Vol. 2 of V. Engelhardt's Handbuch der technischen Elektrochemie. It deals with the electrolysis of water and of alkali chloride solutions, i.e. with production of hydrogen, oxygen, chlorine and alkali. While the volume therefore does not deal directly with metallurgical electrolysis, there is much in it in relation to principles, methods and apparatus that will be of interest to the metallurgical electrochemist. H. W. Gillett (7) -B-

Electroplating (7a)

Chromium Plating on Zinc Alloys should have 0.0003 Inch Thickness. E. A. Anderson & C. E. Reinhard. *Automotive Industries*, Vol. 66, Apr. 1932, pages 528-529, 542. During the past few years it has become common practice to Cr-plate a large number of exposed parts on the automobile. 3 requirements have to be met: (1) the ability to take a satisfactory plated coating; (2) sufficient mechanical strength; (3) low cost. On the basis of tests carried out over a period of 3 to 4 years it has become evident that coatings 0.0003″ or greater in thickness will give satisfactory automotive surface, while coatings even a little thinner will fail in a relatively short time. The author summarizes as follows: (1) Zn is the least expensive non-ferrous metal; (2) Zn alloys of adequate strength and permanence are available; (3) Zn can be successfully plated with Ni and Cr; (4) Zn requires a maximum thickness of 0.0003″ of coating for adequate service life. DTR (7a)

Have you a plating problem?

If you have, these abstracts will help you.

Limits of Economical Current Yields during the Deposition of Cr out of Chromic Acid. (Die Grenzen rationeller Stromausbeute bei der Abscheidung von Chrom aus Chromsäure.) Schöpff & Rassow. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Jan. 15, 1932, pages 36-37. Correlation of current efficiency to current density and H_2SO_4 concentration in Cr plating is shown in a diagram and attention is called to the fact that the range of bright Cr depositions can be enlarged if several "foreign acids" are present. EF (7a)

Chromium Plating of Steel for Wear Resistance at High Temperatures and High Current Densities. A. Willink. *Preprint, The Electrochemical Society*, Vol. 61, Apr. 1932, pages 73-80. See "High Temperature Chromium Plating," *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 347. LCP (7a)

Chromium Plating of Light Alloys. (Elektrolytische Verchromung von Leichtmetallen.) A. Koenig. *Zeitschrift für Elektrochemie*, Vol. 37, Aug.-Sept. 1931, pages 718-721. The greatly different thermal expansion coefficient of Cr and light metals has made a successful Cr plating, even on an intermediary layer of Ni so far impossible. The conditions are discussed; absolute absence of H and HCl seems to be of prime importance. Ha (7a)

The Electrolytic Deposition of Chromium from Aqueous Chromic Acid Solutions. (Ueber die elektrolytische Abscheidung des Chroms aus wässrigen Chromsäurelösungen.) G. G. Schmidt & F. J. Weger. *Oberflächentechnik*, Vol. 9, Sept. 20, 1932, pages 189-191. The electrolytic deposition of metallic Cr from chromic acid depends (1) on the temperature, (2) on the current density, (3) on the concentration of foreign acids, (4) on the chemical nature of the foreign acid. A definite limiting value for the Cr deposition does not exist. The character of the deposit depends much on the foreign acid: it is either very hard so that it can hardly be polished, or it leaves the bath highly polished. Addition of boric acid and ammonium sulphate hardens the coatings which, however, have to be polished afterwards if a bright appearance is desired. The effect of temperature on different additions is shown in tables. Ha (7a)

Practice and Theory of Chromium Plating. (Verchromungspraxis und Theorie.) W. Pfannhauser & G. Elssner. *Zeitschrift für Elektrochemie*, Vol. 37, Dec. 1931, pages 874-886. Investigations were made on the behavior of the cathode material in the deposition of Cr, the nature of the Cr deposited, the influence of the Ni deposit, whether old or newly deposited, on the Cr deposited on Ni, the concentration of the electrolyte, especially the current distribution in the bath, and on the temperature. The form of the cathode is of very great importance to the uniform deposition; a higher or lower content of H_2SO_4 is often applied to take shape into account by influencing current distribution in bath. Ha (7a)

Testing Chromium Plate for Resistance to Abrasion. Harry C. Wolfe. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 60-61. The author points out the differences between "lustrous" Cr plate and that applied for wear resistance. The factors that affect the wear resistance are temperature and composition of the solution and current density. Curves are given showing a sharp peak in the hardness-current density relation. All of the conditions affecting hardness are very critical and must be controlled within a narrow range to obtain good work. A setup for wear testing which gives results reproducible within 10% is described. WLC (7a)

Chromium Plating of Silver Wares. (Verchromen von Silberwaren.) K. Altmannsberger. *Metallwaren Industrie und Galvano-Technik*, Vol. 29, Nov. 1, 1931, pages 483-485. Ag can be Cr plated directly. The depositions adhere well, but emerge dull from the bath and must be polished. However Ag is not sufficiently protected against H_2S. A preceding Ni plating is therefore necessary. An intermediate layer of 0.0001 mm. thickness would be sufficient for securing a bright, tightly adhering Cr plate. Since the protection largely depends on the Ni-layer, the application of 1 amp./dm.^{2} for 5 min. is advised, followed by polishing and Cr plating for 15-20 min. The colors of Cr depositions on 835 and 925 fine Ag do not differ from one another. EF (7a)

Anodes and Auxiliary Anodes in Chromium Plating. (Anoden und Hilfsanoden in der Verchromung.) R. Justh. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Jan. 15, 1932, pages 35-36. Discussion on the composition, shape, current density and structure of anodes employed in Cr plating. EF (7a)

Throwing Power of Chromium Baths. (Über Streuung in Chrombädern.) M. Schlötter. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Jan. 15, 1932, pages 33-34. Diagrams are presented showing the dependence of the throwing power on the current density, and on the ratio of anode to cathode area. If the current density is too high and the anode too small, the central regions, which show the thickest plating, appear dull or even "burnt." Next a zone is encountered exhibiting the natural bright luster of a normal Cr deposit. Since the current density lessens towards the edge, a milky and finally a zone free from any deposit is met with. Since Ni is rendered passive by a CrO_3 solution, the objects should be only immersed when the current is on. EF (7a)

Electrometallurgy (7b)

Electrochemical Handbook. (Handbuch der technischen Elektrochemie.) Vol. 1, Part 2. Edited by Victor Engelhardt. Akademische Verlagsgesellschaft, Leipzig, 1932. Cloth, 7x9½ inches, 331 pages. Price 32 RM. The appearance of Dr. Engelhardt's second volume of the series on technical electrochemistry will be welcomed by all of those persons interested in the electrolysis of solutions containing Au, Ag, Cu and the rare metals, no authoritative treatise having appeared covering the field so completely as this present volume. The art of electrolytic refining has been more or less shrouded in secrecy and although the knowledge outlined in the present volume may to a great extent be familiar to the refiner, it is a noteworthy attempt to assemble available data on the subject. The chapters on the electrolytic refining of Au and Ag have been contributed by Dr. W. Schopper of the Norddeutsche Affinerie, and although short, assemble in a clear cut manner our present knowledge of the refining of these 2 precious metals. Introductory sections deal with the general principles of the respective processes and are in turn followed by discussions on the electrolysis of solutions employing both soluble and insoluble anodes. The reworking of electrolytes is thoroughly discussed and suggestions offered for the design and operation of noble metal refineries. Dr. Schopper has also written the section dealing with the electrolysis of Cu with soluble anodes, which together with the section on electrolysis with insoluble anodes by Dr. G. Eger of Siemens-Halske A.G. constitutes the main part of the volume. The detailed discussion of these 2 processes presents a complete picture of the electrometallurgy of Cu. The chapters devoted to the discussion of electrolysis with soluble anodes deals first with the general chemical and electrical phenomena of the process, followed by an elaborate discussion of the various steps in the process. In addition to those subjects, general consideration is given to contamination, deposition of Cu alloys and Cu bearing metallurgical products, working of anodes slimes, working of worn out electrolyte, metal losses during refining, disposal systems, control, production and selling. The section is concluded with a short chapter on the furnace refining of cathodes. Dr. Eger's section on the electrolysis of Cu with insoluble anodes is noteworthy in that the process offers more problems than electrolysis with soluble anodes and is one that has caused no end of trouble in its applications. The fundamental principles and applications of the process are considered in detail, dealing primarily with the utilization of Cu ores and the recovery of Cu from waste liquors. The historical development of the process is reviewed leading to a discussion of the present position of technology. The economics of the process in comparison with electrolysis using soluble anodes is considered. Descriptions and operating data are given of plants employing this process. The text is well illustrated with charts, drawings and photographs. A bibliography including only important references is appended. The regrettable feature of the book is that the price prohibits its being widely circulated.
G. L. Craig (7b)-B-

The New Refinery at Copper Cliff, Ontario. V. A. James. *Transactions of the Canadian Institute of Mining & Metallurgy* (in *Canadian Mining & Metallurgical Bulletin* 244), Aug. 1932, pages 335-352; *Mining Journal*, London, Vol. 178, Sept. 3, 1932, pages 590-592. The physical equipment of the refinery and its flow sheet are described in detail. Blister Cu is melted, purified and cast into anodes (99% Cu, 0.45% Ni) which go to the tank house. The finished cathodes produced are trimmed and shipped or melted down in wire-bar furnaces. Finished shapes are 99.96% Cu and 0.030-0.035% O. All slag is returned to the smelter. The electrolyte, a $CuSO_4$-H_2SO_4 solution containing 3% Cu and 13% free acid, is heated to 150° F. and circulated through the tanks. To keep the Cu content at 3%, the solution is circulated through tanks with insoluble Pb anodes and regular Cu cathodes. Soluble impurities such as Ni, Fe, As, and Sb are dissolved. To keep these at a minimum, impure solutions first flow through tanks with bottom inflow and outflow and a restricted (10%) outflow from the top. By means of the restricted circulation at the top, Cu in the top effluent is reduced to 1% while Ni and acid are built up. This segregated solution is passed through tanks with Pb anodes and Cu cathodes. Cu is reduced from 12 g./l. to 0.3 g./l. The solution is evaporated from 23 to 60° Bé, the Ni salts crystallize and settle on standing. The supernatent liquid, 54° Bé acid, is returned as electrolyte. The slimes from the electrolytic tanks, containing the precious metals, are roasted and leached to remove Cu and Ni. The leach liquor, after a cementation treatment with Cu sludge to remove any selenious acid, is returned to the tank house. The leached slimes are smelted in a Doré furnace to give a metal about 980 fine in Au and Ag, which is used as the anode in Balbach cells; C cathodes form the bottom of the cell. The electrolyte carries about 1 g. HNO_3 and 50 g. $AgNO_3$/l. The Au mud is retained in cloth-lined baskets. It is treated with aqua regia and AgCl precipitated. The solution carrying Au, Pt and Pd is treated with $FeCl_2$ which precipitates the Au. This is melted and anodes formed for the Wohlwill cells in which the electrolyte is $AuCl_3$. The cathodes are melted to give a Au product 999 fine. AHE (7b)

The Problem of Copper-Nickel Separation. (Das Problem der Kupfer-Nickel Trennung.) W. Savelsberg. *Die Metallbörse*, Vol. 22, Feb. 27, 1932, pages 257-258; Mar. 5, 1932, pages 289-290; Mar. 19, 1932, pages 353-354; Mar. 26, 1932, pages 385-386; April 2, 1932, pages 417-418; Apr. 9, 1932, pages 449-450; April 16, 1932, page 482. A comprehensive review of this problem, which is rarely dealt with in literature is given. Original data on a miscibility gap are given. Orford process, which enlarges the miscibility gap by the application of Na and K sulphides, is discussed. The affinity of Ni and As did not result in the development of a commercial process. The process of Borchers and Zeerleder, which is based on a miscibility gap in the Cu-Ni-Fe-S system produced by the addition of Si, is considered. An Fe-Si layer is formed which contains practically all the Cu present. The author's experiments on the wet process are based on the principles underlying the Mond-Nickel Company's process at Clydach. The separation is not 100% and Cu-Ni sulphate intermediary products must be handled. Tests on a sulphatizing roasting and leaching process yielded encouraging results, but its commercial utilization was not successful. The concentration of Cu by Fe, introduces difficulties due to the complicated separation of Fe and Ni. Data are given on the separation of Ni and Cu by fractional crystallization of the sulphates. The many difficulties involved in the commercializing are discussed critically. Separation by electrolysis is better. The Wohlwill method of the Norddeutsche Affinerie-Hamburg employing Cu-Ni anodes and depositing Cu at the cathode, has been abandoned for economic reasons. Nevertheless many data on this process are presented and the theoretical reasons are given why the electrolysis in sulphate solutions has no great possibilities. The refining process of Cu-bearing Ni in Port Colborn (International Nickel Company) is discussed at length. This represents a reversed Wohlwill process. A true separation in one operation is attained by the J. Savelsberg process of the Allgemeine Elektro-Metallurgische Gesellschaft carried out during a period of 30 years. 7 chemical equations underlying the chloride leaching process are given. For the first time, a detailed description including a great number of important data is given in literature. Details on a plant which produced 2 tons Ni of 99.80% purity per day at an efficiency of 95% are given. EF (7b)

Recovery of Precious Metals from Electrolytic Copper Refining. C. W. Clark & A. A. Helmrod. *Preprint, The Electrochemical Society*, Vol. 61, Apr. 1932, pages 437-450. Detailed description of recovering Cu, Ag and Au from anode slime at the Canadian Copper Refiners plant, Montreal East. The process consists of screening to remove Cu nodules, filtering through Oliver filter, roasting in Nichols-Herreshoff furnace, leaching with foul Cu electrolyte, smelting in Doré furnace, extracting Ag by the Moebius parting process, purifying Au by H_2SO_4 and melting Au in graphite crucible. All gases from the process are scrubbed and dust collected by Cottrell process. Efficiency of system is exceedingly high. LCP (7b)

INDUSTRIAL USES & APPLICATIONS (9)

Why Not Steel Dams? C. Maxwell Stanley. *Engineering News-Record*, Vol. 109, Dec. 1, 1932, pages 652-654. History of steel dam construction is reviewed. Pros and cons of metal dam construction are discussed. Among advantages of steel dam are following: standardized materials, design more determinate, efficient use of material, safety, water-tightness, speed of construction and cost. 10 references. CBJ (9)

Osnabrück Rails Consisting of Two Steels. (Osnabrücker Verbundstahlschienen.) *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 87, Jan. 1, 1932, pages 19-20. An increasing demand for wear resistant rails pointed to adoption of electric steel and to additions of Mn, Ni and Cr. Alloy steels however are too expensive, difficult to work and insufficiently tough at rail foot. Efforts of manufacturing a double steel rail with a hard upper flange and a tough lower flange are historically reviewed. Klöckner Werke brought on market the wear resistant "Osnabrücker Verbundgussschiene," upper flange of which shows 110-140 kg./mm^2 tensile strength while rail foot is soft and tough at 45-60 kg./mm.^{2} The 2 different steels are combined in liquid state, i.e. in the ingot. Gradual transition between upper and lower flange is shown in a macro- and micro-photograph respectively. In tensile tests, rupture never occurred at transitional regions but always in softest parts, i.e., in rail base. Price of Osnabrücker Verbundgussschiene is twice that of ordinary steels, but wear tests in Amsler Testing Machine showed a resistance 5 times that of ordinary rail steel. EF (9)

New Uses for Aluminium. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Apr. 8, 1932, page 357. Contest organized by International Aluminium Bureau in 1931 for rewarding inventors who promoted use of Al and its alloys yielded a prize thesis on use of Al in leather dressing and glove-skin dyeing and 2 prize papers on construction of central heating radiators of Al. A novel suggestion was the manufacture of chemical matches from an Al base. JN (9)

Technique of Construction in Modern Metallic Airplanes. (La Technique de Construction des Avions Métalliques Modernes.) G. Ivanow. *La Revue Industrielle*, Vol. 62, May 1932, pages 241-247; June 1932, pages 299-304. An important trend can be noted in replacement of wood by metals in modern airplane construction but new processes of construction differ from older ones and need to be adapted correctly. Metals which are resorted to in construction of airplane structures are as follows: (1) steels, carbon steels as well as alloy steels (Ni and Ni-Cr) are employed. Cr-Mo steels are used, in shapes or tubes, and fusion welded. Recently stainless steels have been largely employed particularly in seaplane construction. Alloy steels are resorted to for highly stressed parts when welded joints are not needed. But those steels must be correctly heat treated and, for important parts, this can only be done by large and well equipped shops. In France, Ni-Cr-Mo steel (CN-12 from Jacob Holtzer Steel Mills) is largely used. (2) Duralumin can be employed with or without heat treatment. It is noted that in France where duralumin was very largely used there is a tendency towards substitution of steel for duralumin (new "all steel" airplanes from Breguet). (3) Elektron alloys. Uses of those alloys is still in the experimental stage though they have already been employed in Germany and France for the whole construction of airplanes. Article gives details on construction of wings and fairings of the following airplanes: Wilbault 260 R2. Epervier, Junkers G38 and Junkers Junior. FR (9)

New System of Roofing with Thin Copper. Grooved Cleat System (Un nouveau Système de Converture en Cuivre Mince. Le Système à Tasseau Rainuré). *Cuivre et Laiton*, Vol. 5, Nov. 15, 1932, pages 495-499. Constructive details of roofing methods with soft Cu sheets and strips 0.1 to 0.3 mm. thick. Cleats, clamps and other fittings are described and method of joining illustrated. Ha (9)

Pipe Lines For Acid Plants. *Chemical Trade Journal & Chemical Engineer*, Vol. 91, July 8, 1932, page 40. A note on the use of "Ironac," a special acid resisting iron pipe, in chemical and acid plants. JN (9)

Copper as Ornamental Metal. (Kupfer als Schmuckmetall.) *Deutsche Goldschmiedezeitung*, Vol. 35, Dec. 3, 1932, page 486. Discussion of manifold use of this metal for mentioned purpose. GN (9)

Light Metal Rail Bus with Diesel Engine Drive. (Leichtmetall-Schienenautobus mit Dieselantrieb.) *Organ für die Fortschritte des Eisenbahnwesens*, Vol. 87, Mar. 15, 1932, pages 131-132. Favorable ratio of 6.5 tons empty weight: 5.5 tons pay load, never accomplished before with reference to vehicles of this kind, is ascribed to (a) use of a light, high speed 75 hp. Diesel engine (Junkers) and to (b) making of chassis and super-structure of Duralumin. Latter weighs only 3 tons. Rail bus is 12 m. long and 2.8 m. wide. EF (9)

Pneumatic Tools. *Nickel Bulletin*, Vol. 6, Jan. 1933, pages 2-3. Parts of pneumatic tools are made of case-hardened Ni steel as they are subjected to much greater stresses than most other tools. Composition is as follows for:

	Cylinder	Piston	Anvil
C%	0.08-0.15	0.085	0.105
Si%	0.30 (max.)	0.31	0.273
Mn%	0.20-0.60	0.39	0.42
S%	0.035 (max.)	0.032	0.03
P%	0.035 (max.)	0.012	0.012
Ni%	2.75-3.5	4.91	4.91
Cr%		0.53	0.61

Anvil is highly-stressed part to which piston blows are transmitted. Ha (9)

More Nickel-Silver Plumbing Fixtures. *Nickel Bulletin*, Vol. 6, Jan. 1933, page 3. Sanitary fixtures, waste fittings, pipes, etc. in railroad cars, hotels, steamers, etc., are made of a standard nickel silver alloy of at least 20% Ni content. Ha (9)

Buckets Made of Duralumin. (Förderkörbe aus Duralumin.) *Kali, Erz und Kohle*, Vol. 29, Nov. 10, 1932, page 173. Description of buckets made of duralumin as recently installed at a Bavarian mine. Whereas steel cages with double floor had a weight of 4.08 tons and permitted a load of 3.25 tons to be lifted, triple floor duralumin cages weighed but 2.6 tons with an effective load of 4.77 tons to be lifted. GN (9)

Rustless Steel with High Chromium Content. (Rostfreier Stahl mit höherem Chromgehalt.) *Kali, Erz und Kohle*, Vol. 29, Oct. 10, 1932, page 161. Brief resume of production and application of high alloy Cr steels. GN (9)

Grate Bars of Krupp Heat Resistant Steel. (Roststäbe aus Kruppschen hochhitzebeständigen Stahl.) *Feuerungstechnik*, Vol. 20, Jan. 15, 1932, page 15. Note on a high-alloy Cr-steel F.F.118 of Krupp Works, which furnished superior heat and slag resistant grate bars even for high ash coal. EF (9)

Waste Heat Boilers are now Welded. *Freyn Design*, No. 10, Oct. 1932, page 17. A fusion-welded (according to the A. S. M. E. boiler code) boiler reclaims 100 boiler h.p. from 25,000 lbs. of waste gas/hr. at 1000° F. from an open-hearth furnace. Ha (9)

New Water Supply Serves Pennsylvania Coal Towns. *Engineering News-Record*, Vol. 110, Jan. 12, 1933, pages 50-52. Welded steel line 10 miles long laid over rugged country carries 10 m.g.d. Pipe is given a bituminous lining by spinning process. CBJ (9)

High-Chromium Steel Economical in Rabble Arms. *Engineering & Mining Journal*, Vol. 134, Jan. 1933, page 39. Cr-Ni-steel containing 27-30% Cr and 2-3% Ni and a max. of 0.15% C is specified for all rabble arms and teeth, and a straight 15% Cr steel for the lute rings and the hearth rings in roasting furnaces used in roasting Pb and Zn ores. WHB (9)

Continuous Rail on Reinforced Concrete Sleepers. (Das Langschienengleis auf Eisenbetonschwellen.) J. Nemesek. *Organ für die Fortschritte des Eisenbahnwessens*, Vol. 87, Sept. 1, 1932, pages 329-333. Aim of future development of permanent way is joint without gaps. Welding through of rail joints on cross sleepers involves danger of warping and additional stresses. Danger of warping and consequences of a rail fracture are discussed. In conclusion economical side of problem, advantages, i.e. elimination or reduction of number of rail points, elimination of dynamic stresses, smaller wear of vehicles, rails and rail bed, absence of rail creeping and warping, low specific running resistance, and disadvantages, i.e. limited drainage and more difficult tamping of sleepers, are critically discussed. EF (9)

Tool Steels for Pressing of Synthetic Resins. (Stähle für Werkzeuge zum Pressen von Kunstharz.) F. Rapatz. *Stahl und Eisen*, Vol. 52, Dec. 22, 1932, page 1271. Steels with high surface hardness and low hardness-sensitivity, such as alloyed case-hardened steel, nitrided steel or oil-hardened tool steel, are suitable for tools for working synthetic resins. Also corrosion resistance of tools is to be considered. Method for shaping tools in cold state is described. Ha (9)

Aluminum in Transportation and Construction. J. W. Rickey. *Journal Engineering Societies of Boston*, Vol. 3, Feb. 1932, pages 13-14, 23-24. Paper, Northwestern Section, American Society of Civil Engineers, presents some current facts and figures on increasing uses of Al in aircraft, railroad, street car, truck construction, in architectural engineering, cable industry and for special products. EF (9)

This is the age of metals and alloys.

Whether it is a tiny piece of some relatively rare metal for a radio tube or a huge alloy casting for an oil still. These abstracts will tell you what is going on.

Materials and Structural Elements in the Buildings of Rockefeller Center. *Engineering News-Record*, Vol. 109, Nov. 17, 1932, pages 590-592. Table summarizes in detailed form quantity and weight of materials making up several of the units of the Rockefeller Center. Selection of materials for specific requirements is discussed. CBJ (9)

Experiences Gained on the Commonly Used Materials for Melting and Boiling Kettles of Fat and Oil Industry. (Erfahrungen mit den gebräuchlichen Werkstoffen für die Schmelz- und Siedekessel der Fett- und ölindustrie.) *Brennstoff- und Wärmewirtschaft*, Vol. 14, Mar. 1932, page 52; *Feuerungstechnik*, Vol. 20, May 15, 1932, page 76. Favorable thermal conductivity, great physical strength and fair chemical stability of Cu are emphasized. Corrosion from outside due to attack of combustion gases and at inside due to organic acids is less criticised than darkening effect of Cu on some high-grade products. Boiling of oil, for instance, is therefore carried out in Al-containers. Al does not exert a harmful effect upon the drying ability of this product. However Al becomes brittle due to continuous heating to elevated temperatures which drawback is partly counteracted by providing Al-kettles with Cu-bottoms or Fe-hoops. This unfortunately impairs the already relatively low thermal conductivity of Al to a still greater extent. Al is readily attacked by alkalies and cannot be cleaned as thoroughly as Cu. Monel metal shows marked resistance towards hot oils and even towards resins but its heat conductivity is not so good as that of Cu. In case of sensitive fats, the danger of charring of the fat and burning of the kettle bottom is involved. Monel metal is more suitable for oil firing than Cu, but the initial costs are rather high. Stainless steel exhibited no changes of the surface after 2 years service. The color of boiled oils is lighter in stainless steel kettles than in Cu ones. The initial costs are about the same. Enamelled kettles yield the same light color of oils as Monel metal or Al, but they are not very resistant to mechanical stresses and shocks and to uneven heating. Due to its heavy weight, cast Fe is only applied for stationary containers and kettle bottoms and only at low temperatures. At higher temperatures enameling is necessary to prevent coloring of kettle content. Cast Fe is cheapest of all materials and can be used economically by ingeniously directing fire gases around the kettle so as to warrant a uniform heating. EF (9)

New Wonder Metal Beryllium. (Das neue Wundermetall "Beryllium.") G. Anger. *Zentralblatt für die Zuckerindustrie*, Vol. 40, Apr. 27, 1932, pages 328-329. Occurrence, preparation, properties and utilization of Be are reviewed. In sugar industry, it is of particular interest that stainless Be-steel preserves edge of knives and tools used for chopping into small pieces. EF (9)

Causes and Remedies of Breaks in Cast Iron Gridiron Systems. Thomas F. Wolfe. *Water Works Engineering*, Vol. 85, Nov. 30, 1932, pages 1433-1434. Service conditions of today are much different than they were when pipe was installed. Among causes of breaks are following: settlement, poor construction practice, temperature changes, vibration and fatigue, pressure changes, defective material and electrolysis. CBJ (9)

Helium Gas Stored in Pipe Tanks of Welded Steel. *Steel*, Vol. 90, May 16, 1932, page 32. U. S. Navy is using cylindrical tanks 80 ft. long and 2 ft. in dia., constructed of 7/16" welded steel plate, for the storage of helium gas. JN (9)

Welded Steel Frame House is Largely Shop Fabricated. *Steel*, Vol. 90, May 2, 1932, page 35. A steel-frame house was constructed in Oberlin, O. of structural shapes fabricated in the shop and arc-welded on the building site. JN (9)

Designer Predicts Radically Different Age of Steel. *Steel*, Vol. 90, May 9, 1932, page 38. A forecast of wider and more extensive use of steel and steel alloys to be expected in the near future in the construction of house furnishings, furniture, public buildings, automobiles, trucks, boats, airplanes, etc. JN (9)

Use of Tantalum as Substitute for Platinum. (Verwendung von Tantal als Platinersatz.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 15, 1933, page 40. An account is first given of properties of Ta with special reference to its excellent corrosion properties. Its applications are enumerated, the latest one being for spinning dies in the artificial silk industry. Dies put in service about 2 years ago are still in perfect condition. GN (9)

Welded Steel Sheet Houses. (Geschweisste Stahlblechhäuser.) *Stahlbautechnik*, supplement to *Montanistische Rundschau*, Vol. 24, Nov. 16, 1932, pages 6-7. Brief résumé of recent progress. GN (9)

Provides Larger Diameter Corrugated Pipe by Multi-Plate Construction. *Steel*, Vol. 90, May 9, 1932, page 34. New type of large-size drainage pipe, 7½ to 10 ft. in dia., is constructed entirely of deeply-corrugated heavy-gage plates. The plates are galvanized and corrugated in the factory, rolled into circular segments and shipped in 5 and 10 ft. lengths. In the field, the plates are bolted together to form the required pipe. JN (9)

Copper Steel for Dynamo and Transformer Sheets. (Gekupferter Stahl für Dynamo- und Transformatorenbleche.) *Stahlbautechnik*, supplement to *Montanistische Rundschau*, Vol. 24, Oct. 16, 1932, page 8. Abstract of an investigation published in *Mitteilungen der Städtischen Prüfungsanstalt des Wiener Magistrats*. Of decisive importance for applicability of Cu-steels for dynamo and transformer sheets is effect of Cu on magnetic properties. Effect of from 0-4% Cu on magnetic and electric properties, corrosion resistivity, hardness and tensile strength of such sheets (1.5-4% Si) in annealed and unannealed state was investigated. Magnetic properties, induction, maximum permeability and coercive force are practically not changed up to 0.7% Cu, in comparison with Cu-free samples, so that same hysteresis losses may be expected. Contents above 0.7% Cu impair magnetic properties considerably. Electric conductivity and eddy current losses are practically constant. Cu increases considerably resistance to corrosion, in dynamo sheets more than in transformer sheets. Smallest corrosion is apparent at a Cu content at which magnetic and electric properties are not yet changed. Rockwell hardness increases continuously with Cu content. Results show that certain amounts of Cu are detrimental to magnetic, electric and mechanical properties. GN (9)

Nickel-Chromium Alloy Furnace Beams. *Nickel Bulletin*, Vol. 6, Jan. 1933, page 1. Ni-Cr-castings for hearth of a continuous normalizing furnace have been in operation at 1000° C. since Aug. 1931 without interruption except for the ordinary maintenance repairs. Ha (9)

Chromium-Nickel-Iron Castings for Sulphite Pulping Equipment. *Paper Trade Journal*, Vol. 95, Sept. 1, 1932, pages 33-36. Preliminary report and tentative specification of Technical Association of Pulp and Paper Industry. Type "A" has following chemical specifications: Cr 17.5% min., 25% max.; Ni 8.5% min. and 12% max.; C 0.20% max. Type "B": Cr 26% min., 30% max.; Ni 8% min. and 12% max.; C 0.30% max. Mo may be specified up to 4%. Type "A" castings are quenched from 1950-2150° F. while type "B" castings do not require heat treatment. CBJ (9)

Turbine Blades. *The Power Engineer*, Vol. 27, Apr. 1932, pages 145-147. Discusses problem why future development of power generation is largely in hands of metallurgist and considers working conditions to which turbine blades are submitted under a mechanical, thermo-dynamic and metallurgical viewpoint. After paying full attention to erosion and corrosion of turbine blades, the various materials on the British market are discussed including P-bronze, 70/30 brass, copper, Monel metal and alloy steels containing various percentages of Ni, Cr, W. WH (9)

High Strength Wire for Suspension Bridges—Its Use and Abuse. Ernest E. Thum. *Metal Progress*, Vol. 21, June 1932, pages 45-49. Brief discussion of possible stresses to which cable wire may be subjected during suspension bridge construction. Evidence indicates that such strains or possible abuse were not responsible for failure of Mt. Hope bridge at Newport, R. I., and Ambassador bridge at Detroit. Wire used in these structures was heat treated instead of cold drawn—an innovation in bridge building. WLC (9)

Alloy Cast Iron for Use in the Paper Industry. J. S. Vanick & F. L. LaQue. *Paper Trade Journal*, Vol. 94, Jan. 28, 1932, pages 41-44; *Iron Age*, Vol. 129, Feb. 25, 1932, page 499. Advantages of corrosion-resisting cast irons for chemical sections of paper-making plant have their counterpart in improvements effected in constructional cast irons (used for drier rolls, heads, calender rolls, gears, sprockets, etc.) by addition of minor amounts of Ni and Cr. Compositions suitable for castings of these types and operating results are given. Ha (9)

Steel Skeleton and Reinforced Concrete as Combination Construction Method. (Stahlskelett und Eisenbeton als kombinierte Bauweise.) H. Wolf. *Beton und Eisen*, Vol. 31, Sept. 5, 1932, pages 263-266. Writer aims at "improved utilization possibilities for both steel and concrete due to a combination of column form involving a pre-stressing of steel skeleton." After erecting steel-frame pre-stressing is achieved by starting pouring of concrete at top story and finishing with lowest story. Distribution of load is computed. EF (9)

New Forms of Drift Mining Construction with Steel. (Neue Formen des Streckenausbaues mit Stahl.) Rudolf Würker. *Stahl und Eisen*, Vol. 52, Sept. 22, 1932, pages 922-925. Extensive application of steel in place of wood, masonry, concrete, and reinforced concrete construction has taken place lately in German coal mining work. Most common forms, where steel finds wide use, are arched and ring frames and supports which have smallest bending moment for vertical and lateral pressures. In addition use of different designs in I-beams and rails is steadily gaining. A committee composed of members of leading German steel mills was founded in 1930 for studying best designs of beams, composition of steel to be used, method of production, etc., for use in coal mining work. DTR (9)

Metal and Ships. W. R. G. Whiting. *Iron & Steel Industry & British Foundryman*, Vol. 6, Jan. 1933, pages 139-143. High tensile grades of steel are not employed in the ordinary ship, as the ductility and ease of working of the mild grades are of paramount importance. More fundamental development in corrosion-resisting qualities is quite important. CHL (9)

Non-Ferrous Metals in Railway Electrification. Francis A. Westbrook. *Metal Industry*, N. Y., Vol. 30, Oct. 1932, pages 391-392. Quantities of metals employed in operating railways by using electricity for motive power are given. Large quantities of Cu are involved especially for future development. Al has come into extensive use for multiple-unit passenger cars in order to save weight. Amount saved averages 7%. A recent development of Monel metal is its use for bolts, and various fittings for outdoor electrical equipment because of its strength and resistance to corrosion. Light weight self-propelled rail cars with pneumatic tires make use of welded stainless steel for a large part of their structure. PRK (9)

Non-Ferrous Metals in the Aircraft Industry. Francis A. Westbrook. *Metal Industry*, N. Y., Vol. 30, Dec. 1932, pages 463-465. Al is most important non-ferrous metal in aircraft construction but Mg may soon be a serious competitor. Tables list comparisons of material weights, weight and volume relations, composition of alloys and uses. Cu, Sn, Zn, Ni and Pt are used in a wide variety of parts. PRK (9)

Cast Iron, Porcelain Enameled, Finds a New Outlet in Wall Tile. C. F. Wells. *Better Enameling*, Vol. 3, Apr. 1932, pages 4-6, 40. New tile weighs 4¼ lbs./ft.^{2}, is easily applied to the wall and can be used for new or remodeling work. CBJ (9)

Variety of Grades Opens New Fields for Cemented Carbide. Roger D. Prosser. *Automotive Industries*, Vol. 67, Oct. 29, 1932, pages 552-555. Paper Production Meeting S. A. E., Oct. 3, 1932, Buffalo, N. Y. Latest developments and applications of cemented carbides for machining and cutting work are discussed. Today art of production of Widia metal has progressed to a point where, by proper selection of a grade suitable for job to be done, remarkable savings in manufacturing costs are being obtained. To date a variety of grades of Widia have been produced, among which are the Widia "Normal," "H-201," "L-31," "M-68," and "X." Time, economy, saving of extra finish cuts and more work between grinds continue to be outstanding advantages of this cutting material. Uses for each grade are cited. DTR (9)

Working of Locomotive Frame. (Die Bearbeitung der Lokomotivrahmenbacken.) Pontani. *Glasers Annalen*, Vol. 111, Dec. 1, 1932, pages 98-103. Measuring methods on locomotive frames are historically reviewed, methods of working frames and machines used with special reference to grinding machines applied since 1912 are discussed. GN (9)

Investigations and Experiences with Steel Ties. (Untersuchungen und Erfahrungen an Stahlbaggerschwellen.) H. Schaefer. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns*, Vol. 2, Jan. 1933, pages 79-84. Under conditions prevailing in a German lignite mine tests with ties for a mine railroad have shown a decided superiority both in behavior and price economy, in favor of steel tie. Full data of comparison of physical constants are given. Ha (9)

Silver As Bearing Metal. (Silber als Lagermetall.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 8, 1933, page 25. Common bearing metals are unfit for parts rotating in vacuum with high speed, as, for instance, rotating anticathodes of X-ray tubes. Since such bearings are to be used without lubrication, white bearing metals cannot be used, melting point being too low. Best results were obtained with Ag as bearing metal. New method is patented by Siemens-Reiniger-Veifa Co., Berlin. (German patent No. 558,407). GN (9)

Large Uses of Steel in Small Ways. 215th. Article. Pole Line Hardware. *Steel*, Vol. 90, Apr. 18, 1932, page 36. Manufacture of pole steps requires 7000 tons of steel annually. This represents about 1/3 of total steel consumed by 200 different steel products in pole line hardware. Bell Telephone system uses 16,000 tons of pole line hardware, 8000 tons of Fe wire and 8100 tons of wire strand annually. JN (9)

Large Uses of Steel in Small Ways. 216th Article. Portable Garages. *Steel*, Vol. 90, May 2, 1932, page 42. Building of small steel garages consumes 10,000 tons of steel annually. Most of this is in the form of galvanized steel sheets although steel angles, door hinges, handles and bolts require a considerable part. JN (9)

Large Uses of Steel in Small Ways. 217th Article. Chain-Link Billboards. *Steel*, Vol. 90, May 16, 1932, page 34. New type of display sign for outdoor advertising purposes makes use of a steel or Al open-mesh chain fabric for supporting the advertising material, which consists of letters and designs cut from sheet steel. JN (9)

Chrome-Nickel Steel Expansion Plates Used on Highway Bridges. *Steel*, Vol. 90, Apr. 18, 1932, page 34. During past 3 years over 125,000 lbs. of Cr-Ni steel have been used in the form of expansion plates for bridge construction in Pittsburgh district. JN (9)

Opportunities with Stainless. *Sheet Metal Worker*, Vol. 23, Dec. 1932, pages 516-517, 536. Number of examples for ornamental use of stainless steel in display windows, store fronts, etc. is illustrated and described. Ha (9)

All-Steel Construction Used in New Diesel-Electric Power Barge. *Steel*, Vol. 90, Apr. 11, 1932, page 35. Description of new all-steel, riveted barge, *Energy*, built by Texas Co. JN (9)

Hold Clinic on Steel House, Market for 3,500,000 Tons. *Steel*, Vol. 90, May 30, 1932, pages 13, 56. Report on various papers and discussions presented at a forum on the steel house sponsored by the American Institute of Steel Construction, held in New York, May 24-25, 1932. JN (9)

Drilling Tests with Widia Tips. (Bohrversuche mit Widiaschneiden.) O. Müller & H. Wöhlbier. *Kohle und Erz*, Vol. 29, July 1, 1932, pages 195-198. Detailed description of drilling tests with Widia tips which have been reviewed in *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Apr. 17, 1932, page 210. See "The Suitability of Widia Cutting Edges for Drilling in Solid Rock," *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 38. GN (9)

Extending Life of Cylinders, Pistons and Piston Rings. (Verbesserung der Lebensdauer von Zylinder, Kolben und Kolbenringen.) E. Mahle. *Verkehrstechnik*, Vol. 49, Oct. 5, 1932, pages 549-554. The heavy wear of pistons and cylinders in internal combustion engines is criticized, the causes are dealt with in great detail, and the former achievements in eliminating this source of trouble are summarized. Recent tendencies are fully considered, pertaining to improvements of the alloys employed and advances of the structural designs, mainly referring to the transmission of force from the piston head, perfections of the Nelson-Bohnalite piston, new patterns of piston rings, reduction of the play at the piston bottom, utilization of special piston ring carriers. It is predicted that light metal pistons will surpass the life of gray cast Fe ones in the near future. WH (9)

Light Metal Automobile Bodies of the Saurer Co., Arbon. (Ueber Leichtmetall-Karosserien der Ad. Saurer A. G., Arbon.) M. Koenig. *Schweizerische Bauzeitung*, Vol. 100, Oct. 1, 1932, pages 182-184. Light Al alloy Anticorodal has been used for cross-beams, posts, seats, planking. Many parts of body including switch board are made of Elektron. GN (9)

Elektron Metal as Structural Material in Transportation Industry. (Elektronmetall als Werkstoff im Verkehrswesen.) Keinert. *Verkehrstechnik*, Vol. 49, Mar. 15, 1932, pages 150-152. Following data on Mg-alloy Elektron are given in table, spec. weight = 1.8, lower melting point = 400° C, higher melting point = 625°-650° C., shrinkage = 1.3%, specific heat = 0.24, electrical conductivity = 12-18, thermal conductivity = 0.32, coefficient of expansion =

Temperature	Cast Alloy AZF, AZG	Press Alloy AZM, VI	Piston Alloy
20-100° C	25.5 x 10–6	24.0 x 10–6	24.0 x 10–6
20-200° C	27.1 x 10–6	25.7 x 10–6	24.8 x 10–6

Recent fatigue tests made in the Technische Hochschule München yielded the following data as compared with commercial Al-alloys: (kg./mm.^{2})

Alloy	Specific Weight	Dynamic Tensile Compressive Test	Dynamic Bending Test	Dynamic Torsion Test
Elektron AZG	1.82	6.0	7.0	3.8
German Alloy	2.87	4.85	4.5	2.5
American Alloy	2.77	6.95	6.0	2.85
Silumin	2.62	4.90	4.5	3.6
KS-Seewasser	2.67	4.85	4.5	2.5
Lautal LIV	2.77	6.0	5.5	2.5
Alufont (hart)	3.32	4.7	5.5	1.8

The abundantly illustrated paper points out advantageous application of Elektron metal to structural members of airplanes, busses, street cars and presents experiences gained on their actual commercial use up to present. EF (9)

The Safety of Aged Boilers. V. B. Harley-Mason. Memorandum by Engineer-in-Chief, Manchester Steam Users' Association, May 1932, pages 28-42. Various factors in the serviceability of old wrought Fe boilers are discussed, including the variability in quality of old wrought Fe, presence of welding flaws, brittleness of tube ends from work hardening in expanding, failures by corrosion-fatigue, punching of holes instead of drilling, etc. It is concluded that it is not justifiable to condemn boilers on the score of age alone, but only after minute examination. HWG (9)

Contribution of the Study of Length of Life of Steel Mill Ingot Molds. (Contribution à l'Etude de la Durée des Lingotières d'Aciéries). J. Durand & J. Vernay. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, July 1932, pages 247-248. Paper read before World Foundry Convention, Paris, 1932. Difficulties of comparing, on correct basis, life of cast Fe ingot molds are given. Life of ingot molds depends not only upon their own quality but also upon the conditions to which they are subjected in the steel plant (type of pouring, direction of current of poured metal, time that ingot remains in mold, handling, kind of coatings, quality of skin to be obtained on ingot, etc.). After they are out of service, ingot molds show a pick up of S on their working face. It is now established that this S comes from the tar coating generally used. Dilatometric study proves very useful for cast Fe intended to cast ingot molds. Defects of ingot mold surfaces, appearing during service, can be associated with the "growth" of cast Fe and it can be assumed that the lower the growth of Fe the greater the length of life of ingot molds. Among the means to stabilize cementite of cast Fe, in order to prevent growth, the author indicates additions of Cr + Ni. An ordinary cast Fe mold allows an average production of 110 ingots whereas a cast Fe of the following composition, total C 3.45, graphitic C 2.8, Si 2.10, Mn, 0.5, S 0.1, Cr 0.7, Ni 0.4, leads to the casting of an average number of 135 ingots. FR (9)

HEAT TREATMENT (10)

Liquid Baths for Heat Treating-Oil and Lead. W. Paul Eddy, Jr. *Iron Age,* Vol. 130, Sept. 1, 1932, page 323, adv. sec. page 20. Discusses various types of liquid baths, their advantages and disadvantages, and right and wrong method of using them. Most important points in favor of oil tempering baths are, low cost of furnace installation and readiness with which oil baths may be incorporated into continuous production line. Pb is used for tempering and hardening steel. Pb should be free from Sn and S. Properly handled Pb bath eliminates scaling of steel tools. Care should be taken in using Pb on account of its poisonous effects. VSP (10)

Heat-Treatment on a Jobbing Basis. J. B. Nealey. *American Machinist,* Vol. 76, Aug. 31, 1932, pages 964-965. Equipment of small shop with cyanide lead and salt baths and heat treating furnaces for great variety of work to get flexibility and economy of operation is described. Ha (10)

Problems and Practices in the Heat Treatment of Steel Castings. A. W. Lorenz. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 252-268. A summary, with additional data by the author, of the heat treatment of C and alloy steel castings, considered collectively in which annealing, normalizing, spheroidizing and tempering are adequately discussed. VVK (10)

Is your Heat Treating plant up-to-date? This section digests the world's heat treating practices.

Heat Treatment of Metallurgical Products. (Traitments thermiques des produits metallurgiques.) A. Portevin. *Aciers Spéciaux, Métaux et Alliages,* Vol. 7, July 1932, pages 242-256; Aug. 1932, pages 282-297; Sept. 1932, pages 318-328; Nov. 1932, pages 396-412. Gives in condensed form, essentials of problem of heat treatment of metallurgical products. Of numerous methods and apparatuses used in controlling heat treatment, following are discussed in detail: (1) Double galvanometer, Saladin-Le Chatelier-Broniewski for automatic tracing on photographic plate a curve showing as functions of the temperature of the sample. (2) Chevenard's differential dilatometer. (3) Thermo-magnetic apparatus. $Fe-Fe_3C$ diagram is discussed as means of studying heat treatment. GTM (10)

Hardening Oils. (Härteöle, Abschreckbäder, Temperaturmessgeräte.) K. Krekeler. *Eidgenössische Materialprüfungsanstalt,* Zurich, Report No. 64, 1932, pages 22-31. First 3 chapters discuss quenching oils, drawing oils and oils for blackening of screws and other parts. Chemical composition, physical properties and requirements which such oils have to meet are discussed and results of quenching tests on 6 different steels (tool, structural, spring and high speed steel) are given. Considerations on proper conditions of quenching tanks are given and finally a discussion on temperature measuring equipment of latest design. GN (10)

Heat Treatment of Accurate Parts, Small and Spindling. Harry Rogers. *Metal Progress,* Vol. 21, June 1932, pages 35-39. Discussion of heat treating operations in manufacture of small intricate alloy, and C-steel parts for semi-automatic equipment for sending and receiving messages by telegraph. WLC (10)

Automatic Heat Treating Equipment. D. L. Brown. *American Machinist,* Vol. 76, Oct. 26, 1932, pages 1092-1093. Describes equipment for automatically controlling time and temperature for heat treating shafts in a bath of molten Pb at from 1500° to 1800° F. Ha (10)

Heat Treatment of Chromium-Nickel Steel. M. S. Aronowitch, G. L. Biser & B. N. Meschaninov. *Domez,* No. 12, 1931, pages 70-84. (In Russian). Using 0.14 C, 1.0 Cr, 3.5 Ni steel it was found that sufficient softening for working after forging can be obtained by drawing to 650° C. followed by furnace or air cooling. Dimensional changes were studied by determining volume changes of rings. Least change was observed after normalizing and drawing at 650° C. 0.5% increase in this case amounts to 1% after drawing alone. Normalizing from slightly under or over critical temperature correspondingly decreases or increases expansion of steel. (10)

The Precipitation Theory of Steel Hardness. Correspondence from Roy M. Allen. *Metals & Alloys,* Vol. 3, Oct. 1932, pages 233-234. Presents ideas on hardening of steel which involve consideration of allotropic forms of C as well as those of Fe. Includes micrographs of martensitic cast Fe containing crystals of the same characteristics as the diamond. WLC (10)

Heat Treatment of Gray Cast Iron. (Die Wärmebehandlung der grauen Gusseisens.) P. A. Heller. *Die Giesserei,* Vol. 19, Oct. 14, 1932, pages 413-419. Critical review of literature on heat treatment of gray Fe up to and including 1930 permits drawing following conclusions and recommendations: Mechanical properties of cast Fe can be influenced by quenching from temperatures above Ac_1 and tempering between 300°-400° C., in particular in ferritic cast irons of high content of Si, structure of which is greatly refined. It is a question of economy whether increase in mechanical quality is worth expensive and time consuming heat treatment. Tensile properties are influenced by graphite content and distribution to a much greater extent than by metallic structure. Although refining of a casting might in some cases be very useful and economical general application will be on a limited scale only as improvement obtained is too small and cracking which sometimes occurs makes economic advantage questionable. Ha (10)

Influence of Heat Treatment on Various Properties of Ordinary, High Grade and Special Cast-irons. (L'Influenza del trattamento termico su alcune propieta delle ghise comuni, di qualita, e speciali.) G. Calbiani. *La Metallurgia Italiana,* Vol. 24, Dec. 1932, pages 929-945. After review of improvements made in high grade, and special cast-irons, by addition of Ni, Cr, Mo, W, Cu, etc., methods of heat-treatment to improve their properties are reviewed. Among these are, tempering below critical temperature, to eliminate internal stresses from uneven cooling. Annealing above critical temperature to improve working qualities of castings, by reducing excessive graphite formation. Normalization, hardening, and hardening and tempering, are also used. Hardening should not be so drastic so as to avoid excessive graphite formation, and is used only where high abrasive resistance is desired. Cementation, and nitridation processes, little used up to recently, in connection with cast-Fe, are being studied more and more. Effect of above processes on mechanical properties, resistance to corrosion, resistance to wear, and on internal structure of 4 important types of cast-Fe, i.e. ordinary, high grade, Ni, and Cr-Ni cast-irons, were studied in detail. Conclusions arrived at are: heat treatment, especially hardening (in oil) followed by tempering improve mechanical properties so much as to be worth added cost. In most cases, hardening and tempering, whether or not preceded by cementation, usually decrease resistance to corrosion by dilute mineral acids, but improves resistance to corrosion by running water. Normalization, with or without previous cementation, and cementation with subsequent hardening, increase markedly resistance to wear, while annealing greatly reduces resistance to wear. Influence on structure is not definite; in most cases structure appeared to be in a state of transition, and not clearly defined. Effect of cementation on structure still remains uncertain. AWC (10)

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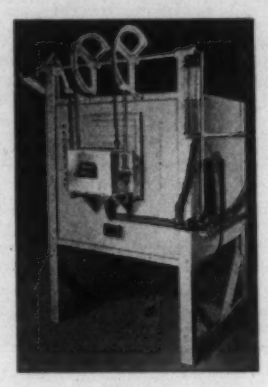

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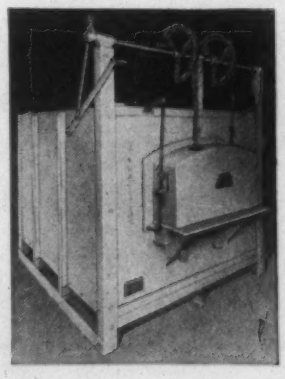

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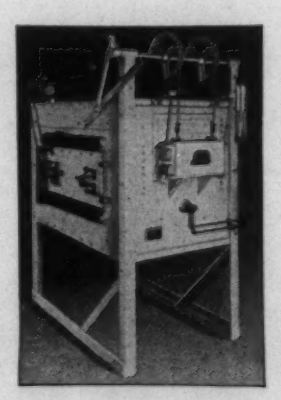

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Hardening (10a)

Rails with Hardened Joint. (Schienen mit vergütetem Stoss.) PETER JENS. *Schweizerische Technische Zeitschrift*, Vol. 29, Nov. 3, 1932, page 677. Upper surface and 2/3 of joint surface on the head are heated with a torch, quenched in water and drawn by the torch to about 375° C. The yield point is thus raised from 50 to 75 kg./mm.^{2}, the tensile strength from 90 to 140 kg./mm.^{2}, and Brinell hardness from 280 to 325. GN (10a)

Heat Treatment of High Speed Steel Tools. (Die Warmbehandlung der Werkzeuge aus Schnelldrehstahl.) H. KALPERS. *Gas und Wasserfach*, Vol. 75, Nov. 26, 1932, page 956. Brief account is given of results of a French investigation (B. Jousset, *L'Usine*, 1931, No. 22, pages 27-29.) After discussing advantages and disadvantages of various fuels and furnaces for heat treatment of high speed steels, it is pointed out that gas heated furnaces are preferable provided combustion takes place within a short space. Gas heated furnaces are highly adaptable, furnace atmosphere can be properly adjusted, this holds true particularly for reducing atmosphere required in heat treating high speed steels. GN (10a)

Scientific Knowledge of Hardening Practice. (Die Praxis des Härtens unter Berücksichtigung wissenschaftlicher Erkenntnisse.) V. FABIAN. *Eidgenössische Materialprüfungsanstalt*, Zurich, Report No. 64, 1932, pages 41-50. Discusses importance of spark test. A number of cases are considered which show how failures may be avoided in hardening pieces of intricate shape. Annealing of every piece before hardening is stressed first to eliminate stresses set up during shaping. Causes of failures in case carburizing are discussed. Results of right and wrong procedures in case carburizing are compared. GN (10a)

To Harden Metal Magnetic Field Must Be Correct. Correspondence from E. G. HERBERT. *Metal Progress*, Vol. 22, July 1932, pages 53-54. In commenting on article (*Metal Progress*, June 1932) by Harrington in which failure to obtain magnetic hardening was reported, Herbert calls attention to necessity of maintaining a narrow-range of field strength in magnetic treatment. Too strong a field produces a definite softening. WLC (10a)

Annealing (10b)

Progress in the Annealing of Wire. O. S. HASKELL. *Wire & Wire Products*, Vol. 8, Feb. 1933, pages 37-39. New batch-type annealing furnace of General Electric Co. is described which assures good uniformity of anneal, low first cost and operating cost, and portability. It is gas-tight for annealing in certain atmospheres. Ha (10b)

Study of Low Carbon Wires by X-ray Diffraction Methods. NORMAN P. GOSS. *Transactions American Society for Steel Treating*, Vol. 20, Oct. 1932, pages 314-320. Author has studied annealed low C Bessemer and open-hearth steel wires with X-ray with following finding, (1) Bessemer steel given same mechanical and heat treatments was more sluggish to recrystallization, (2) when subject to 10% reduction of area by drawing and annealed at 1300° F. no grains recrystallized in Bessemer wire while very large grains grew in open-hearth wire, (3) paper discusses effects of impurities in Bessemer steel and their effects upon recrystallization. WLC (10b)

Annealing Tubing in Immersed Electrode Type Electric Furnaces. A. E. BELLIS. *Fuels & Furnaces*, Vol. 10, Sept.-Oct. 1932, pages 549-550. Heat for annealing tubes is generated by heating a bath of "Lavite" in which tubes are immersed. Physical properties of tubing so treated at different temperatures are given; tubing is free from scale and other surface defects. Ha(10b)

The Annealing of Large Pressure Vessels. E. C. CHAPMAN. *Fuels & Furnaces*, Vol. 10, July-Aug. 1932, pages 437-442, 460. Furnace equipment used for relieving stresses in a large pressure vessel due to welding process and its operation are described. Metallurgical reasons for process are explained. Ha (10b)

The Annealing of Steel Castings. W. R. D. JONES & P. FIELD FOSTER. *Proceedings South Wales Institute of Engineers*, Vol. 48, July 15, 1932, pages 211-212. Discussion. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 10. AHE (10b)

Electric Annealing Furnace in Metal Industry with Special Reference to Bright Annealing Methods. (Der elektrische Glühofen in der Metal-Industrie unter besonderer Berücksichtigung der Blankglühverfahren.) G. KELLER. *Schweizerische Technische Zeitschrift*, Vol. 29, Dec. 15, 1932, pages 757-763. Discusses improvements that have been attained in recent years in annealing non-ferrous metals in electric furnaces. Electrically heated furnaces are distinguished by much better control, better adaptation of annealing to other processes of working, they render possible bright annealing which is required in many cases. Following 4 bright annealing methods are discussed at length (1) Kenworthy method, (2) Heddernheim method, (3) Brown Boveri method, (4) Brown Boveri-Grünewald method. GN (10b)

Short-time Annealing of Aluminum Strip and Sheet in Continuous Electric Furnace. (Das kurzfristige Glühen von Aluminiumbändern und -blechen in elektrischen Durchziehöfen.) H. MASUKOWITZ. *Zeitschrift für Metallkunde*. Vol. 24, Sept. 1932, pages 236-239. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. Discussion of construction and use of continuous electric annealing furnace, of methods for determining heating curves on thin strip, of Erichsen values and annealing time at different temperatures, of influence of short-time annealing. Best furnace temperature for most rapid short-time annealing is 700° C., judging from Erichsen values and grain structure; equally good results may be attained by heating sheet for a short period with temperature range 420°-550° C. Data and curves showing effect of oven temperature and sheet temperature upon Erichsen values are given. RFM (10b)

Bright Annealing in Gas Atmosphere. S. Z. OWEN. *Electrical World*, Vol. 100, Dec. 3, 1932, pages 760-761. Bell-type furnace containing central and concentric cylindrical heating elements is used to anneal stacks of coiled cold-roll strip. Atmospheric air is flushed out of furnace by city gas which is then replaced by dissociated anhydrous ammonia. This annealing gas is composed of about 25% N_2 and 75% H_2 by volume. CBJ (10b)

Annealing of Steel in an Artificial Atmosphere. Resistance Electric Furnace. (Recuit de l'acier dans une atmosphere artificielle. Fours electriques à recuire chauffés par resistance). L. PERSOZ. *Aciers Spéciaux, Métaux et Alliages*, Vol. 7, June 1932, pages 207-215. Annealing steel in H, N, HH_3 and electrolene atmosphere is discussed. In annealing steel effect of decarburization must be considered according to equation $C + 2H_2 \rightarrow CH_4$. Sykes' work on equilibrium of mixture H-C-CH_4 in presence of steels shows that a 2% CH_4 in the annealing atmosphere will be sufficient to prevent decarburization when a 0.59% C steel is heated at 850° C. GTM (10b)

Aging (10f)

Studies on Precipitation Process in Age-hardening Nickel-Silicon Alloys. (Studien zum Ausscheidungsvorgang an aushärtbaren Silizium-Nickellegierungen.) O. DAHL. *Zeitschrift für Metallkunde*, Vol. 24, Nov. 1932, pages 277-281. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. Ni-Si alloys (4.6-8.6 weight % Si) age-harden and are especially suitable for study of "normal" (room temperature) and "artificial"(slightly elevated temperature) age-hardening. These alloys, like duralumin, increase in electrical resistance during precipitation hardening at low temperatures. Precipitation is very slow, and alloys cooled from 950° C. to room temperature in furnace over a period of 10 hours, age-harden nearly as much as quenched alloys. Diagrams are given showing changes in hardness and electrical resistance during aging at various temperatures over a period of time. RFM (10f)

JOINING OF METALS & ALLOYS (11)

Tests of Joints in Wide Plates. WILBUR M. WILSON, JAMES MATHER & CHARLES O. HARRIS. *Journal American Welding Society*, Vol. 11, Dec. 1932, pages 27-31. Report of an investigation conducted by Engineering Experimental Station, University of Illinois, in coöperation with Chicago Bridge & Iron Works. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 350. TEJ (11)

Soldering (11b)

Liquidol, a New Soldering Flux. (Liquidol, ein neues Lötmittel.) *Deutsche Goldschmiedezeitung*, Vol. 36, Jan. 21, 1933, page 3. New flux described offers several advantages over borax and "Fluoron." (1) Higher viscosity, (2) much lower melting point than borax and fluoron, (3) applicability to all metals, as Au, Ag, brass, Cu, Ni, Fe and steel, also rustless steels, (4) higher capillary activity than other fluxes, (5) high absorption capacity of oxides, (6) high efficiency. Composition of Liquidol is not given. GN (11b)

Cadmium in Soft Solders. (Kadmium in Weichloten.) *Die Metallbörse*, Vol. 20, Jan. 2, 1932, pages 2-3. Evolution of Cd-solders is traced and developments in Europe due to lack of Sn are considered. American Cd-solders usually run higher in Sn. 3 objections to use of Cd are critically discussed. Tarnishing can be overcome by low additions of Zn (1.3-3%), which also increases solidification range, lowers solidification point and improves physical properties. Oxidation losses during melting can be eliminated by covering melt with a layer of resin or Zn-chloride. Following flux is suggested for typical Cd-solders: 65 $ZnCl_2$, 14 KCl, 11 NaCl, 10 NH_4Cl. Utilization of glycerine or resins does not yield the same strength properties. A standard German solder of 80 Pb, 10 Sn, 10 Cd equals in strength solders with 40% Sn. A cheaper alloy with 5% Sn, and 10% Cd is still equivalent to 25% Sn solders as to general properties. Sn-free Cd solders with low Zn-contents are best suited for soldering brass sheets, but relatively low strength values are secured on Sn plated material and on Cu. EF (11b)

Silver Solder for Soldering of Platinum. (Silberlot für Platinlötungen.) *Deutsche Goldschmiedezeitung*, Vol. 35, Dec. 10, 1932, page 5. 80 g. fine Ag, 10 g. brass and 10 g. Cu are melted together as soldering metal. This solder has high strength and has a white color as contrasted with Au solder. GN (11b)

New Flux for Metal Soldering. *Brass World*, Vol. 28, Dec. 1932, page 256. "Flosol," manufactured by the American Chemical Paint Co., is a new type of flux for soldering steel and most non-ferrous metals except Al and its alloys. It is a creamy substance that is painted on the surface with the claimed advantage of neither running nor spreading upon application of heat. Other advantages claimed are: low cost, cleanliness and ease of application, absence of corrosive fumes, limited spread and elimination of pits in solder due to entrapped flux, time saving, and whiteness of fluxed area. WHB (11b)

Cadmium Soldering. (Le saldature al cadmio.) G. MONTELUCCI. *L'Aerotecnica*, Vol. 12, Mar. 1932, pages 299-313. Review of experiences made during war with some Pb-Cd alloys for soldering and more recent researches in this line. Description of investigations carried out in Great Britain by Deeley and others on Cd-Zn soldering intended especially to examine resistance of this soldering to slow stresses, in which this alloy has nearly 6 times more resistance than Sn-Pb alloy. Tests were carried out in workshop to examine suitability of the Cd-Zn alloy eutectic in substitution for usual alloy for soldering. Tests have been carried out with usual workshop methods and showed that Cd-Zn eutectic as also other alloys of same type as eutectic compound, are well adapted for soldering ferrous parts, showing a shear strength which has ratio 7:4 to that of Sn-Pb alloy. It is advantageous in soldering Cu parts. Another advantage of Cd-Zn eutectic consists in electrolytic tension that is positive against Fe, thus protecting against corrosive attacks. Use of Cd-Zn eutectic is recommended as a substitute for brass brazing in some cases to prevent the thermal alteration of steel due to the high melting point of brass. GG (11b)

Utilization of Cadmium. (Über die Verwendung von Cadmium.) A. F. BURSTALL. *Giesserei und Maschinenbau Zeitung*, Vol. 5, Jan. 1932, pages 7-8. Cd exerts favorable influences on soft solders. American solders contain about 25% Cd, 50% Sn, 25% Pb while a standard German alloy runs as follows: 10% Cd, 10% Sn, 80% Pb. Cd bearing solders sometimes darken when exposed to atmospheric influences. But this is only case under unfavorable circumstances. Tendency of Cd solders towards oxidation can be largely checked by additions of 1.5-3% Zn. Zn furthermore enlarges solidification range, lowers solidification point and results in a gain of strength. Best flux is $ZnCl_2$. EF (11b)

Heat Consumption in Soldering Sheets. (Wärmebedarf beim Weichlöten von Blechen.) H. VOIGT & H. WERTHEIM. *Archiv für Wärmewirtschaft und Dampfkesselwesen*, Vol. 13, Nov. 1932, page 294. Heat required in kcal./m. of soldered seam on tinplate, Zn, brass and Cu sheets, .2-1 mm. thick is determined. Electrically and gas heated soldering irons were used. A linear dependence of specific heat consumption on sheet thickness was found. Further tests are to determine at which thermal efficiency of soldering highest tensile strengths are attained, i.e. most favorable ratio between heat required and tensile strength. GN (11b)

Aluminum Solders. (Aluminium-Löte.) E. R. THEWS. *Werkstattstechnik*, Vol. 26, June 15, 1932, pages 240-242. General description and newest developments in hard and high-melting solders such as Al plus 5-30% alloying elements such as Cu, Zn, Sn, Sb, Cd, Ni, Si and in soft and low-melting solders, Al plus Zn and Sn. RFV (11b)

Tin Solders. S. J. NIGHTINGALE. Chemical Catalog Company, New York, 1932. Cloth, 5x7½ inches, 89 pages. Price $1.50. As intended by the author the book is a good résumé of the article previously published in England (The Jointing of Metals. Part I. Soft Solders and Soldered Joints. S. J. Nightingale. British Non-Ferrous Metals Research Association, Research Report No. C 234-213, 1929). The earlier report represented a 7 year study of solders under the auspices of the British Non-Ferrous Metals Research Association. In addition the book conveys more practical information. The book should be welcomed not only because it is good but particularly because there is a dearth of such books.

The metallography of Pb-Sn and Pb-Sn-Sb is well considered especially where the solder alloys are concerned. On page 4 it is said that Pb will hold 2.5% Sb in solution at 247° C. and .8% at 25° C. The latter value should be .25%. For the purpose of estimating the solid solubility of Sb in solders, a diagram is given on page 18. In connection with it a statement is made on page 19 that Pb takes practically no Sb into solid solution. This need not be taken as contradictory to the statement on page 4 because alloys containing 25-75% Sn are mainly referred to.

The discussion of methods of using solders gives many fine ideas regarding bit ("iron") soldering, "stick" soldering and wiping. Tension tests, impact strength and shear strength tests of solders and soldered joints are reported in considerable quantity. No "creep" strength tests or fatigue tests are reported or mentioned.

Comments on corrosion resistance of solders in the former article (or booklet) are omitted in the book.

Considerable discussion is well given on the advantage of having a flux that melts lower than the solder; though the NH_4Cl-$ZnCl_2$ eutectic is particularly mentioned, its composition, 29% NH_4Cl-71% $ZnCl_2$, is not given. In the bibliography there is an error, the Bannister and Tabor reference should be 1909,2 instead of 1926,26. G. O. Hiers (11b) -B-

Welding & Cutting (11c)

All-Steel Auto Bodies Are Flash Welded. *Steel*, Vol. 90, Apr. 11, 1932, pages 31-33. A description of the flash welding method of joining formed steel sheets as employed in Phila. plant of E. G. Budd Mfg. Co. in manufacture of monopiece all-steel automobile bodies. JN (11c)

The Practical Application of the Arcogen Welding Method with Special Reference to its Suitability to Welding of the Technically Important Materials. (Die praktische Anwendung der Arcogen-Schweissverfahrens unter besonderer Berücksichtigung seiner Geeignetheit für das Schweissen der technisch wichtigen Werkstoffe.) H. MÜNTER. *Apparatebau*, Vol. 44, June 24, 1932, pages 87-92. Same as article in *Die Schmelzschweissung*, Vol. 10, page 279. See *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 41. GN (11c)

Giving the Weld a Chance. G. E. THORNTON. *Journal American Welding Society*, Vol. 11, June 1932, pages 10-11. Discussion. For abstract of paper see *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 328. The discussion shows that: (1) The ordinary McAdam type cantilever fatigue specimen is suitable for fatigue tests on butt welds and gives satisfactory results. (2) A uniform strength type specimen is not as satisfactory as the McAdam type specimen either from the standpoint of design or machining costs. (3) The relatively low endurance limits obtained from bare electrode butt welds is the result of the inherent properties of the welds and not of the design of the fatigue specimen. TEJ (11c)

The Application of Arc Welding to the Design of Steel Buildings for the Resistance of Earthquake Forces. H. H. TRACY. *Welding Journal*, Vol. 29, Aug. 1932, pages 240-242. **Welded Joints for Seismic Stresses in a Tall Building.** H. H. TRACY. *Engineering News-Record*, Vol. 109, Sept. 15, 1932, pages 312-313. Welded joints of structural steel assemblages are more compact and more rigid than riveted joints. These advantages were utilized in the design of a 13 story office building in Los Angeles to resist earthquake forces. Riveted construction, as required by the building code, carries the vertical live and dead loads. Costs and other constructional data are given. TEJ + CBJ (11c)

A Few Valuable Facts on Electric Welding. (De quelques données utiles concernant le soudage électrique.) HENRI VUILLEUMIER. *Schweizerische Technische Zeitschrift*, Vol. 29, Sept. 1, 1932, pages 546-549. The paper first discusses in general the advantages of electric a.c. welding including the electrodes used. Theoretical discussions on current and voltage of welding follow. Welding of condensers and of some metals and alloys, such as high speed steel, Cu and duralumin is described. GN (11c)

Comparative Time Study of the Forging and Torch-Cutting of Soft Steel Rings. (Zeitvergleich für das Schmieden und Brennschneiden schmiedeeiserner Ringe.) E. VOIGTLÄNDER. *Maschinenbau*, Vol. 11, Mar. 17, 1932, pages 127-128. These 2 ways of manufacturing steel rings out of soft steel are compared. It is shown that cutting the rings out of plates means saving 69% of the time required by forging. RFV (11c)

Have You a Joining Problem?

From January to July 1933 this section digested 399 articles on welding, cutting, soldering, brazing and riveting.

Welding of Cast Elektron Housings. (Schweissen von Elektronguss Gehäusen.) H. A. HORN. *Azetylen in Wissenschaft und Industrie*, Vol. 35, June 1932, pages 87-91. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 73. WH (11c)

Recent Advances and Future Expectations of the Oxyacetylene Process. JAMES H. CRITCHETT. *Journal American Welding Society*, Vol. 11, Dec. 1932, pages 8-9; *American Metal Market*, Vol. 39, Nov. 24, 1932, pages 5, 7. Paper read before 33rd Annual Meeting, International Acetylene Association, Philadelphia, Pa., Nov. 1932. In addition to being a repair tool, oxy-acetylene blowpipe has become a production tool. Author predicts further use of blowpipe in cutting, hard facing, welding of new metals and alloys and in heat treating. DTR + TEJ (11c)

What Does It Cost to Weld Pipe and Fittings? IV and V. ARTHUR E. CHRISTEN. *Welding*, Vol. 3, Oct. 1932, pages 597-602; Nov. 1932, pages 651-654. The author discusses the welding of bell and spigot type joints, extra strong pipe, and shows how data contained in tables previously presented for oxy-acetylene welding can also be used for computing costs for arc welded joints. TEJ (11c)

Oxy-Acetylene Welding of High-Grade Materials. (Die Azetylen-Sauerstoffschweissung hochwertiger Werkstoffe.) W. HOFFMANN. *Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens mittels Sauerstoff und Azetylen*, Series 7, 1932, pages 30-33; *Azetylen in Wissenschaft und Industrie*, Vol. 35, Mar. 1932, pages 33-36. On basis of tests conclusive evidence was gained that welding wire or electrode is determining influence on quality of weld. Especially in welding high-grade structural steels, St 48 and 52, containing Cr, Cu and Mo, the welding wire must be of such composition that weld possesses 100% of strength of base material. Several curves show influence of alloying materials on weld but actual compositions are not given. WH + Ha (11c)

Arc Welded Brake Drum. (Lichtbogengeschweisster Bremszylinder.) *Die Electroschweissung*, Vol. 4, Jan. 1933, pages 12-13. Description of construction and welding of brake drums of mine winding machines. Difference in weight of welded steel construction in comparison with former cast steel drums amounts to 43%, chiefly due to decrease in wall thickness from 34.5 to 17 mm. Production costs of welded drum were 39% lower. GN (11c)

Rules of Lloyd Register of Shipping for Application of Arc Welding. (Vorschriften des "Lloyd's Register of Shipping" für die Anwendung der Lichtbogenschweissung im Handelsschiffbau.) *Elektroschweissung*, Vol. 3, Dec. 1932, pages 234-236. Paper discusses Apr. 1932 modifications and additions of preliminary rules of 1919, (1) general, (2) preparation of work, (3) details of construction, (4) rules and investigations on admission of welding electrodes, mechanical tests. GN (11c)

Arc Welding of Aluminum. (Lichtbogen- Schweissen von Aluminium.) *Elektroschweissung*, Vol. 3, Oct. 1932, pages 194-195. For welding Al, wire of same composition is used, for ageable alloys such as Duralumin, wire containing about 5% Si. Electrodes must possess a thick coating containing required fluxes. Special precautions are considered, arc should be rather short, electrode must always be positive terminal, piece to be welded, negative terminal. Preparation of sheets to be welded is discussed and procedure of welding outlined. Arc welding of Al is cheaper than gas welding. GN (11c)

Welding Wires for the Acetylene-Welding of Steel. (Ueber Schweissdrähte für die Azetylenschweissung von Stahl.) E. Streb. *Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens,* Vol. 7, 1932, pages 33-42. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 40. (11c)

Addition Materials for Acetylene Welding of Steel. (Ueber Zusatzstoffe für die Azetylenschweissung von Stahl.) E. Streb & H. Kemper. *Autogene Metallbearbeitung,* Vol. 26, Jan. 1, 1933, pages 2-8. Influence of composition of welding rod on welding of steel was investigated. Superiority of materials with higher C and Mn content (0.8-1.0% Mn and 0.2% C), over material with less (0.1% C and 0.3-0.5% Mn), was proved with regard to tensile strength, bending strength and impact-tensile strength. Tests with welding wires which can give in a welded seam high notch-toughness values without any subsequent treatment have not yet led to definite results. A subsequent treatment (hammering, etc.) also improved quality of seams made with usual welding wires. Additions of Ni and Mn gave particularly good results with respect to tensile strength and elongation. Ha (11c)

Four Problems Encountered in Flash Welding Mild Steel. E. R. Torgler. *Journal American Welding Society,* Vol. 10, Sept. 1931, pages 29-36; discussion, Dec. 1931, pages 15-17. Paper presented at Fall meeting of American Welding Society in Boston, Sept. 1931. Problems encountered in flash welding middle rings for pipe couplings were: (1) determination of necessary flash and upset (burn and jam) for a satisfactory weld, (2) comparison of flash weld and roll weld on same size middle ring, (3) tensile tests of middle ring skelp, before and after welding, (4) secondary piping and segregated impurities as causes of defective flash welds. Tensile tests, macroscopic and microscopic examination were used in solving these problems. See also *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 40. TEJ (11c)

Welding Cast-Iron Locomotive Cylinders. James M. Vossler. *Welding News,* Vol. 3, Apr.-June 1932, pages 21-23. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 14. Ha (11c)

An Experiment Using Bessemer Steel for Welded Pipe. A. A. Tylik. *Domez,* No. 9, 1932, pages 42-49. (In Russian.) 3 heats of Bessemer steel were rolled into skelp and made into lap and butt-welded pipe. The pipes formed well, but due to high P content (0.127%) rimming steel used could not meet physical specifications when made in pipes. (11c)

Japanese Install Equipment for Welding Pipe. Maurice Taylor. *Welding,* Vol. 3, Oct. 1932, pages 577-578. Some interesting comments on present status of arc welding in Japan. TEJ (11c)

Oxy-Acetylene Welding Torches with Multiple Flames for Manual Welding. (Acetylen-Sauerstoff-Schweissbrenner mit mehreren Flammen für Handschweissbetriebe.) E. Zorn. *Autogene Metallbearbeitung,* Vol. 26, Jan. 1, 1933, pages 9-15. Flame of welding torch has 3 functions: preheating of material, preheating of welding wire, and fusing material and wire. An arrangement with 2 flames whereby one preheats either material or wire and other does fusing, offers advantages with respect to reliability of quality of weld as also to greater welding velocity. Operating conditions are investigated and a few constructions of 2-flame burners described. They can be used for high pressure and low pressure acetylene. This method is particularly useful for materials of over 8 mm. thickness. Ha (11c)

Welding and Testing Arc Welded Pipe Joints. O. A. Tilton & Robert Daniels. *Welding,* Vol. 3, Nov. 1932, pages 645-650, 654. Paper presented before the American Gas Association, Ninth Annual Distribution Conference, Birmingham, Alabama. The authors present test data which show the quality of welded pipe joints obtainable with heavily coated electrode. Types of joints welded and tested were bell and spigot, double bell with chill band and straight butt. Welding conditions and tensile and bend test data are tabulated. TEJ (11c)

Large Copper Hydrogen Welding Furnace. *Metal Industry,* N. Y., Vol. 30, Nov. 1932, page 432. Recent installation of a copper hydrogen electric welding furnace, 6 feet diam. and 82 feet long, at Bundy Tubing Co., is described. In it any number of steel parts having several joints can be welded together simultaneously. A reducing atmosphere is constantly maintained in furnace which is kept at a temperature somewhat higher than melting point of Cu. Steel surface is first deoxidized, Cu powder or wire around joints then melts and flows over steel and into joints and then Cu and Fe alloy together. PRK (11c)

Freight Cars with Welded Carriage Body. (Güterwagen mit geschweissten Wagenkasten.) *Organ für die Fortschritte des Eisenbahnwesens,* Vol. 87, June 15, 1932, page 238. Describes 20 and 60 ton freight cars, bodies of which are made of welded 5 mm. Cu-bearing steel sheets. However, 3.5-4 mm. sheets are sufficient, according to practical experience. Superstructure requires 3 mm. sheets. Electric spot welding was mostly applied besides gas welding. Bolts and screws are only employed where parts are liable to require replacement. Weight of freight cars was reduced by 400 kg. by welding. Initial costs were lower, maintenance expenses are cut down and transportation costs are also reduced. EF (11c)

Fundamental Research Problems in Welding. *Journal American Welding Society,* Vol. 11, Dec. 1932, pages 18-26. List of undertakings associated with Fundamental Research Committee of American Bureau of Welding and Engineering Division of National Research Council. Also a list of Fundamental Research Problems in Welding, solution of which will be a real service to the welding industry. These problems are divided into groups and suggestions are given as to how some of problems may be approached. TEJ (11c)

Welding Steel Structures. *Electrical Engineering,* Vol. 51, Oct. 1932, pages 713-714. General remarks on rapid development and application of welding to fabrication of steel structures. Several examples illustrate savings obtained over other methods of joining. Ha (11c)

Hydrogen Phosphide (PH_3) in Acetylene. (L'Hydrogène Phosphoré dans l'Acétylène.) *Revue de la Soudure Autogene,* Vol. 24, May 1932, page 2519. PH_3 shows some disadvantages when present in acetylene used for welding (it gives phosphoric acid which attacks the nozzle of the torch, sticks on the metal and gives more or less toxic atmosphere). A study leads to following conclusions: (1) Presence of neither calcium phosphide in Ca carbide nor of PH_3 in acetylene can cause spontaneous combustion. (2) For 20 or 30 years proportion of Ca phosphide in Ca carbide, and consequently PH_3 in acetylene, has not varied. (There is about 30 to 60 cc. of PH_3 in 100 liters of acetylene). (3) Accuracy of methods of analysis is greater than previously and content of PH_3 obtained would be, apparently, 25 to 30% higher. FR (11c)

Arc Welding Research. *Electrician,* Vol. 109, Oct. 14, 1932, pages 472-474. When great care was taken to work with pure materials no arc could be formed at 120 volts with pure Fe electrodes in an inert atmosphere, argon. When the argon had as little impurity as 30 parts per million an arc could be formed. The implications of this work are far-reaching as the basic ideas of the nature of arc discharge may require modifications. CBJ (11c)

Combustion of Welding Rod Constituents and Nitrogen Absorption in Arc Welding. (Die Verbrennung der Elements des Schweissdrahts und die Stickstoffaufnahme aus der Luft beim Lichtbogenschweissen.) *Elektroschweissung,* Vol. 3, Dec. 1932, page 233. Abstract of a paper in *Polytechnisch Weekblad,* 1931, No. 41. A general survey is first given to elucidate occurrences of combination of elements. 3 types of rods, uncoated and coated, were tested. Results show that chiefly C and Mn burn out. Besides O, N has a large bearing on quality of weld. With uncoated rods up to .15% N, with coated rods up to .04% N were absorbed. N is most detrimental; tensile strength and notch toughness are impaired. GN (11c)

Evaporation of Lead in Homogenous Lead Lining. (Bleiverdampfung beim homogenen Verbleien.) *Die Schmelzschweissung,* Vol. 11, Nov. 1932, page 239. Evaporation of lead in welding depends to a great extent on flame, oxy-hydrogen flame evaporates greatest amount while flames containing hydro-carbons do this to a much lesser degree and therefore minimize danger of lead poisoning for welder when breathing lead-laden air. Ha (11c)

The Use of Copper Forms in Shape Welding. Miles C. Smith. *Welding Engineer,* Vol. 16, May 1931, pages 45-47. Use of Cu form in welding confines weld deposit to desired area and thus eliminates much if not all grinding, but its use is confined almost entirely to arc welding. Examples are given of use of Cu form for the building up of oil-field drilling bits and gear wheels. Ha (11c)

1 **Offset Electrodes Can Be Water-Cooled.** G. N. Sieger. *Automotive Industries,* Vol. 67, Oct. 15, 1932, page 481. Welding of larger formed parts, especially where product has curves and artistic shapes has offered many problems to welding engineer. One of these problems has been curving and offsetting of electrode shanks, to enable operator to reach welding spots. A satisfactory method of building water-cooled holders of almost any design is given. Author claims that this holder will last for years, and water-cooled tip will last many times as long as uncooled Cu tip, without mushrooming or replacing. Cleaner, safer and faster welds may be obtained. Correct and incorrect methods are shown in diagram. DTR (11c)

Welding Is a Major Manufacturing Process in Building the Ford Motor Car. W. W. Macon. *Iron Age,* Vol. 129, June 16, 1932, pages 1306-1310.

2 Outstanding in general welding procedure is the provision of numerous special machines, many of them automatic or semi-automatic. Large amount of welding is done by flash resistance method but a lot of spot welding also is in use and some arc welding. Highspeed seam welding is controlled by photoelectric tube. VSP (11c)

New Gas Welding Process for Pipe Line Construction. E. Marshall. *Gas Engineer,* Vol. 49, Feb. 1932, pages 73-75. A new welding process, invented by the Linde Air Products Co., is claimed to be a practical and successful application of metallurgical knowledge and skill to oxy-acetylene welding and to result in the production of superior welds at greatly increased speed. High strength welds at high speed are achieved by (1) a special flame adjustment, (2) the use of a special welding rod, (3) a new welding technique, known as backhand welding

3 in which the flame is pointed backward against the weld and the flame and rod manipulated more or less parallel to the line of welding. Reports on welders qualification tests, tests on samples taken from a 10" outside diameter seamless pipe of 0.25-0.35% C, 70-80000 lbs./in.^{2} tensile strength and on bending tests performed on a 20" outside diameter, 5/16" wall, high C seamless pipe. WH (11c)

Corrosion-Resisting Alloy Steels. Practical Notes on Welding Methods. H. Martin. *Chemical Trade Journal & Chemical Engineer,* Vol. 89, Dec. 25, 1931, pages 631-632. The types of stainless steels most commonly employed in welding are the austenitic Ni-Cr steels. These are less likely to lose their corrosion-resisting properties when heated. In most cases, the work should be annealed after welding. The preferred methods of oxy-acetylene welding, electric arc welding, resistance welding, etc. and the precaution to be observed with each method

4 in handling stainless steels are described. JN (11c)

Welding of Copper. H. Martin. *Metal Industry,* London, Vol. 41, Dec. 30, 1932, pages 627-628; Vol. 42, Jan. 6, 1933, pages 7-10. Includes discussion. Different methods of welding Cu are reviewed. Metal arc offers greatest advantage due to its great heat concentration but in welding compact masses work must be preheated as heat conductivity of Cu is too great to produce sufficient heat to melt the base metal. Atomic hydrogen arc process is of little value in Cu welding as H has in its atomic state an affinity for Cu and goes into solution with the molten metal and is released on cooling so that a porous material results. Carbon arc is not extensively used yet but offers great possibilities as C contamination of the weld can be avoided by keeping arc as long as possible without breaking, at

5 about 75 volts at 200 amps. for material ½" thick. Most satisfactory electrodes are of graphite 9" long by ½" in diameter, tapering down to ¼". Acetylene torch is very suitable for Cu welding but welding in an overhead position affords almost unsurmountable difficulties to the oxy-acetylene welder. Although gas welding is usually employed now, the electric methods deserve more consideration. Ha (11c)

The Welding of Metals with Special Reference to Flux-Coated Electrodes. E. Dacre Lacy. *Sheet Metal Industries,* Vol. 6, May 1932, pages 47-48, 50, 53-54. Showing possibilities in high strength, high quality welding with flux-coated electrodes. AWM (11c)

Electric Welding of Fire Engines. (Elektroschweissung im Feuerwehr- Fahrzeugbau.) Lange. *Elektroschweissung,* Vol. 3, Oct. 1932, pages 190-193.

6 Description of new type welded emergency car with hoisting equipment. Considerable saving in weight was effected by suitable dimensioning and welding. GN (11c)

Scrapping Railroad Rolling Stock. W. H. Ludington. *Welding,* Vol. 3, Nov. 1932, pages 635-637. Paper presented before the Fall Meeting of the American Welding Society at Buffalo, Oct. 1932. The oxy-acetylene cutting torch has placed railroad car and locomotive scrapping operations on a profitable basis. TEJ (11c)

Automatic Welding with Heavily Coated Electrodes. Laurence R. Leveen. *Journal American Welding Society,* Vol. 11, Nov. 1932, pages 29-30. Paper presented at Fall Meeting, American Welding Society, Buffalo, Oct. 1932. Description of newly developed automatic welding head designed for feeding heavily

7 fluxed electrode. Physical properties of various types of welds made with this equipment are given. TEJ (11c)

Improved Procedure and Technique Evolved in Spread of Shielded Arc Welding. J. F. Lincoln. *Oil & Gas Journal,* Vol. 31, Sept. 29, 1932, page 116. Pipe lines in which shielded arc welding process was used are enumerated. VVK (11c)

The Principles of Bronze-Welding. A. R. Lytle. *Journal American Welding Society,* Vol. 11, Dec. 1932, pages 14-17. Paper presented at Sept. 20, 1932 Meeting, New York Section, American Welding Society. Author outlines general characteristics of bronze-welding rods and describes procedures that should be followed in order to obtain maximum benefits from process. Limitations of process are pointed out and test data is presented to show high strength and ductility

8 that can be secured. TEJ (11c)

The Design, Construction and Costs of Arc Welded Pebble Mills. D. L. Pellett. *Paper Trade Journal,* Vol. 95, Dec. 22, 1932, pages 289-292. Details of design and a thorough cost analysis are explained for the fabrication of a pebble mill. An arc welded mill can be designed that will withstand severe load conditions with an ample margin of safety. Welded construction is shown to be less costly, weighs considerably less and can be put into operation more quickly. CBJ (11c)

Pre-Qualification Tests for Welders. Ernest Lunn. *Journal American Welding Society,* Vol. 11, Oct. 1932, pages 10-12. Paper presented at Fall meeting of American Welding Society in Buffalo, Oct. 1932. Recommendations

9 compiled from minutes of meetings of Committee on Qualification Tests for Welders of American Welding Society covering: (1) general requirements, (2) topics for examination, (3) weld quality tests. TEJ (11c)

Formation of Carbon Monoxide in Fusion Welding. (Ueber Kohlenoxydgasbildung beim Autogen-Schweissen.) H. W. Nies. *Die Schmelzschweissung,* Vol. 11, Nov. 1932, pages 238-239. Attention is called to fact that pure oxygen supplied to acetylene in welding flame does not suffice for complete combustion of C_2H_2 to CO_2 and H_2 and that surrounding air has to furnish deficiency. It is shown that CO can be formed in dangerous quantities if care is not taken to admit fresh air in sufficient amounts from all sides, especially in closed or small rooms. Ha (11c)

Electro Welding in Mining Industry. (Elektroschweissen im Bergbau.) H. von

10 Neuenkirchen. *Internationale Bergwirtschaft und Beratechnik,* Vol. 25, Jan. 15, 1932, pages 4-7. Electro welding is suitable for hard service machinery used in mining. Gas welding is more economical only for Fe sheets below 4 mm. thickness and for "cold" cast Fe welding. Built-up welding jobs in mining industry are discussed and a cost estimate is made. Initial costs for installing an electric welding shop amount to 3000 RM. EF (11c)

Classification of Welded Seams. (La Classification des Soudures.) R. GRANJON. *Revue de la Soudure Autogène,* Vol. 24, May 1932, page 2509. Author thinks there is a tendency to prescribe too high a resistance for welded joints without considering kind of work. He proposes 3 classes (1) High strength seams (for chassis and driving parts in motor car construction) (2) Common seams (such as motor car rear differential cases) (3) Finishing seams (such as for auto bodies). Each kind should have its own specifications. It would then be possible to select method for performing weld, metal of suitable weldability, nature of feeding rods, welder, control, etc., according to class and specifications to be answered. FR (11c)

Rapid Calculation of Welded Joints in Metallic Construction. (Calcul Rapide des Assemblages Soudés en Charpente Métallique.) H. GERBEAUX. *Revue de la Soudure Autogène,* Vol. 24, May 1932, pages 2510-2512. Gives 2 charts which permit finding dimensions of seams in different conditions. Examples are given for various joints made with plates and V shaped bars. FR (11c)

Occurrences in Electric Welding Arc. (Über die Vorgänge im elektrischen Schweisslichtbogen.) H. VON CONRADY & G. MÜLLER. *Die Elektroschweissung,* Vol. 4, Jan. 1933, pages 1-6. Report of Welding Research Laboratory, Technische Hochschule Berlin. Investigations of authors aim at an elucidation of mechanical and electrophysical occurrences in welding arc. Previous investigations are reviewed. Mechanism of discharge on cold and hot cathodes is discussed at length. Thermal conditions are particularly referred to, as well as facts and occurrences known in welding practice. GN (11c)

Building Up and Heat Treating Rail Ends. WALTER CONSTANCE. *Journal American Welding Society,* Vol. 11, Dec. 1932, page 13. Paper read before 33rd Annual Meeting, International Acetylene Association, Philadelphia, Pa., Nov. 1932. Author cites his experiences in building up, reforming and heat treating rail ends, telling of progress made since 1914 and cost of doing this work by oxy-acetylene method. TEJ (11c)

All-Welded Bridge in Pilsen, Czecho-Slovakia. (Eine vollständig geschweisste Strassenbrücke in Pilsen.) FRANZ FALTUS. *Stahlbau,* Vol. 5, Sept. 2, 1932, pages 142-144; *Zeitschrift des Oesterreichischen Ingenieur und Architektenvereins,* Vol. 84, Sept. 9, 1932, pages 188-189; *Elektroschweissung,* Vol. 3, Jan. 1932, page 14. A survey is given on welded bridges built in Europe and America since 1928. The described bridge with a span width of 49.20 m. is largest up to present time. Non-coated core rods were used in d.c. welding. Welders were first subjected to qualification tests. Following results were obtained in tensile tests. 10 mm. plate, V-weld, flush; welded horizontally: 37.9 kg./mm.^{2}, welded vertically: 34.4 kg./mm.^{2}; 25 mm. plate, V-weld, flush, welded horizontally: 41.4 kg./mm.^{2}, welded vertically: 38.4 kg./mm.^{2}. Overhead welding was avoided as far as possible. Bridge weighs 146 tons, which contrasts with 175 tons for a corresponding riveted construction. Bridge was welded on the building site. Results of loading tests are reported. GN (11c)

Principles and Practice in Welded Joint Design. GILBERT D. FISH. *Engineering News-Record,* Vol. 109, Dec. 29, 1932, pages 773-777. Theoretical and practical considerations of joint analysis are discussed. Formulas for beam connections and splices, column splices, and truss joints are derived. Practical weld-connection analysis is an important contribution to structural welding knowledge. CBJ (11c)

Electric Arc Welding with Automatic Feed of the Welding Rod. (Lichtbogenschweissung mit selbsttätiger Schweissdraht- Nachführung.) E. DINGLINGER. *Der Werksleiter,* Vol. 6, Dec. 1932, pages 275-276. Description of adjustable grips and of welding apparatus in which welding rods can be fed with variable speed according to rod diameter. GN (11c)

The Application of the Oxy-Acetylene Process in the Production of Motor Cars. R. E. ESCH. *Sheet Metal Industries,* Vol. 5, Mar. 1932, pages 787-791. Paper read before the 32nd Annual Convention of the International Acetylene Association, Chicago. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 305. AWM (11c)

Stainless Steels and Irons. J. H. CRITCHETT. *Journal American Welding Society,* Vol. 11, Nov. 1932, pages 32-34. Paper presented at May 24, 1932 New York Section Meeting, American Welding Society. Describes metallurgical, physical and welding properties of straight Cr irons and stainless steels as well as 18% Cr-8% Ni alloy. TEJ (11c)

German Ship Builders Use Arc Welding Extensively. HANS H. DIERGARTEN. *Metal Progress,* Vol. 22, July 1932, pages 60-64. Welded marine construction provides a 3% reduction in cost and a 12 to 17% reduction in weight as compared with riveted construction. Welded vessels have additional advantage of being less sensitive to vibration. WLC (11c)

New Electrically Welded Bridge. H. E. GROVE. *Commonwealth Engineer,* Vol. 20, Aug. 1, 1932, pages 5-7. Welding job carried out at the West Melbourne Gas Works, where an overhead coal viaduct of 31 ft. span was replaced by a bridge 53 ft. span, which was designed as a monoferric structure by electric welding, done exclusively with No. 6 gage uranium electrodes at 220 amps. WH (11c)

Electrically Welded Floating Dredge. (Elektrisch geschweisster schwimmender Greifbagger.) E. FOSS. *Die Elektroschweissung,* Vol. 4, Jan. 1933, pages 9-11. After dealing with dimensions and construction, welding of dredge is described in detail. Direct current with 18-20 volts, about 150 amperes and 4 mm. thick electrodes were used, length of seams totalling 1800 m. Welding offered following advantages: (1) higher strength by better utilization of profiles used, (2) better protection of structural members, (3) saving in weight of about 20% as compared with riveting, (4) 10% saving in labor. GN (11c)

Eye Protection in Welding Operations. RAYMOND R. BUTLER. *Welding Journal,* Vol. 29, Dec. 1932, pages 361-364, 373-376. Paper read before Midlands Branch of Institution of Welding Engineers at Birmingham, Nov. 14, 1932. Includes discussion. 3 influences from which welder's eyes need protection are: (a) Ultra-violet waves, producing skinburn and a tendency to conjunctivitis. Effects of these waves are sometimes very painful, but apparently seldom permanent. (b) Infra-red (heat) waves, producing unnoticed optical fatigue and ultimately injuring eyesight by causing cloudiness of aqueous portions of eye, and possibly permanent cataract. (c) Visible radiations summed up under term "glare." In general, black, amber, green, greenish-yellow and red glasses can now be made capable of protecting eye against ultra-violet rays while infra-red rays can be excluded by glasses whose tints are deep black, yellowish-green, sage green, and bluish green. Standardization of eye protective glasses is urged. TEJ (11c)

Discussion of Paper by C. A. Wills on "Welded Rolled Steel Design for the Iron and Steel Industry." R. A. BULL. *Journal American Welding Society,* Vol. 11, Dec. 1932, pages 31-32. Discussion of paper presented at Fall Meeting of American Welding Society in Buffalo, Oct. 1932, and printed in *Journal American Welding Society,* Vol. 11, Sept. 1932, pages 8-13. Author takes exception to some statements by Wills in regard to quality of castings furnished by American steel foundries. TEJ (11c)

Rebuttal to Discussion by R. A. Bull on Mr. Wills' Paper, "Welded Rolled Steel Design for the Iron and Steel Industry." C. A. WILLS. *Journal American Welding Society,* Vol. 11, Dec. 1932, page 33. In defense of his previous statements, author points out relatively large percentage of steel casting rejections made by his company during 1929 and 1930 in comparison to rolled steel rejections. He agrees with Bull that many advances have been made toward producing sound castings, that dependence on steel castings for a great many purposes is absolutely necessary and that real test of progress for any material or method of construction lies in need for economical construction of satisfactory equipment. TEJ (11c)

Manufacturers Develop New Equipment for Reconditioning Oil and Gas Pipe Lines. JAMES D. CUMMINGS. *Oil & Gas Journal,* Vol. 31, Sept. 29, 1932, page 125. Reconditioning pipe lines has required the development of ditching and cleaning machines as well as improved welding procedure. VVK (11c)

Modern Arc Welded Home. A. M. CANDY. *Welding,* Vol. 3, Oct. 1932, pages 581-584. Describes design details and construction of welded steel house. Factory assembly of sections permits erection in 15 days. Entire framing consists of 17 tons of 20, 18 and 16 gage sheet steel. TEJ (11c)

Reliability of Welding. A. S. COOMBS. *Journal of the Engineering Societies of Boston,* Vol. 3, Apr. 1932, pages 14-19. Besides careful inspection, proper qualification of welders to assure safety in a welded structure is stressed. Various tests to which welding operators should be submitted are dealt with and data from report of Structural Steel Welding Committee of American Bureau of Welding are given. EF (11c)

What must Welding Expert Know of Metallography? (Was muss der Schweissfachmann von der Metallographie wissen?) H. A. HORN & K. TEWES. *Die Schmelzschweissung,* Vol. 11, Nov. 1932, pages 251-254. This installment explains changes in structure of Fe when other elements as for instance Mn, Si, P and S are added. Microphotographs of welds explain the article. Ha (11c)

Use of Acetylene Welding for Repairing Boilers. (Anwendung der Azetylenschweissung bei der Ausbesserung von Kesseln.) W. HÖHNISCH. *Azetylen in Wissenschaft und Industrie,* Vol. 35, Dec. 1932, pages 183-184. Reports on a welding job on a boiler of 6 m. length, 1.8 m. diameter and 20 mm. sheet thickness. 2 boiler tubes were removed and the holes closed by Fe sheets welded on. Costs 12.05 R.M. or about $3 for the 3.77 m. seam length. WH (11c)

Construction of Dry Purifiers. THORNTON F. BRIGHT. *Welding,* Vol. 3, Oct. 1932, pages 585-588; Nov. 1932, pages 638-639. Welding details employed to produce stronger units, more resistant to corrosion, and better in appearance, at a lower cost. TEJ (11c)

Application of Gas Welding to Structural Steel Work. (Die Anwendung der Gasschmelzschweissung im Stahlbau.) W. HÖHNISCH. *Azetylen in Wissenschaft und Industrie,* Vol. 35, Jan. 1932, pages 10-12. Critical comparisons between electric and gas welding with reference to structural work is made in the introduction. The possibility of gas welding in this particular field is shown by 2 exhibition halls of 68 m. and 22 m. length respectively at the Bauaustellung Berlin, 1931, the largest building of its kind erected by gas welding in Germany. WH (11c)

Utilization of Acetylene Welding in Mining Industry, Particularly in Lignite Mines. (Anwendung der Azetylenschweissung im Bergbaubetriebe, insbesondere im Braunkohlenbetriebe.) W. HÖHNISCH. *Azetylen in Wissenschaft und Industrie,* Vol. 35, Oct. 1932, pages 152-154. Acetylene welding is predestined for the great variety of built-up jobs involved in mining industry. Attention is directed to the advantageous use of welding for repairing the giant segments incorporated in the drying furnaces of German lignite briquette plants. Detailed cost sheets are given, which indicate that 28,000 R.M. out of 40,000 R.M. could be saved due to the use of welding. WH (11c)

Job Welding Shop's Place in the Industry. E. H. BROWN. *Welding,* Vol 3, Oct. 1932, pages 573-575. Describes several unusual welding jobs. TEJ (11c)

Bridges are reinforced by Welding. (Brücken werden durch Schweissung verstärkt.) OTTO BONDY. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Dec. 11, 1932, pages 661-662. An account is given of welded bridges built in recent years in Germany and abroad. Investigations by Schaechterle (*Bautechnik,* Vol. 10, Oct. 5, 1932, pages 590-593; Oct. 14, 1932, pages 603-605) and Graf (*Stahlbau,* Vol. 5, Nov. 11, 1932, pages 187-192) are touched upon. Testing of welded structures by X-rays and Huggenberger tensometer are considered; advantages of welding for bridge construction are enumerated. Extensive use of welding for this purpose is predicted. GN (11c)

Welding to Balance the Budget. W. M. B. BRADY. *Industry & Welding,* Vol. 5, Jan. 1933, pages 7-8. Savings in production and manufacture of special machinery were made by extensive use of welding as no patterns and no castings were necessary, waste of material and machining was reduced to a minimum. Ha (11c)

Electrical Welding of Tramway Rail Joints. (Elektrisches Schweissen von Strassenbahnschienenstössen.) H. BAUER. *B B C Nachrichten,* Vol. 19, Nov.-Dec. 1932, pages 114-115. It is shown that in properly electrically welded joints a tensile strength of about 80% of non-welded rail can be attained. In comparing costs of aluminothermically welded and arc welded rails it was found that costs including first costs for welding transformer are by about 25% lower for latter method. Process for electric welding method and Brown Boveri welding transformer are described. GN (11c)

Hamburg Remote Gas Supply System and Modern Pipe System Construction. (Die Hamburger Ferngasversorgung und der neuzeitliche Rohrleitungsbau.) A. E. BECKMANN. *Gas und Wasserfach,* Vol. 75, Dec. 17, 1932, pages 993-998; Dec. 24, 1932, pages 1020-1024. Welding methods are discussed in detail. GN (11c)

Cutting Steel With Oxygen Machines. C. G. BAINBRIDGE. *Welding Journal,* Vol. 29, Dec. 1932, pages 365-371. Paper read before members of Institution of Welding Engineers, Nov. 16, 1932. Includes discussion. Brief history of development of O machine cutting and discussion of effect of O cutting on material, speed and quality of cut, choice of gas, costs and various applications of process. Steel up to .30 C can be cut cold and used exactly as cut. Steels containing .30 to .40 C should be preheated before, or normalized after cutting if the article is to be machined. Steels containing over .40 C should always be preheated. TEJ (11c)

A Bridge Method of Testing Welds. J. R. BATCHELLER. *Electrical Engineering,* Vol. 51, Nov. 1932, pages 781-783. Weld is made a part of an oscillatory magnetic circuit by passing an exploring device over it; the impedence of this circuit changes according to the condition of the weld and can be measured by a bridge method. The whole outfit consists of the oscillator supplying the alternating current, the a.c. bridge, exploring device and balance indicator showing the condition of the weld. Ha (11c)

Lead-in Wires for Vacuum Tubes. THOS. F. FAULHABER. *Wire & Wire Products,* Vol. 7, Nov. 1932, pages 379-381, 402. Different welding methods for fine wires which lead current into incandescent lamps, radio tubes, etc., are described in detail. Ha (11c)

An Electrically Welded Bridge According to D I N 4100. (Eine nach D I N 4100 elektrisch geschweisste Brücke.) L. GERSTENBERG. *Elektroschweissung,* Vol. 3, June 1932, pages 116-118. Detailed description of construction and welding of a road bridge in Hamburg. The saving in weight due to welding amounted to 16.7%. GN (11c)

Design of a Welded Frame Girder. (Entwurf eines geschweissten Rahmenbinders.) HARRY GOTTFELDT. *Der Stahlbau,* Vol. 5, Oct. 14, 1932, pages 165-166. Principles are discussed which were to be borne in mind in designing and welding frame girders of a large hall. GN (11c)

Electric Welding. (Elektrische Schweissung.) W. GÜTSCHOW. *Schiffbau, Schiffahrt und Hafenbau,* Vol. 33, Feb. 1, 1932, pages 40-41. Specifications of German-Lloyd on utilization of electric-welding in shipbuilding are reviewed in detail. Stress is placed on the making of samples to be submitted to referee testing under auspices of German-Lloyd. WH (11c)

The Arc Welding of Structural Steel. J. H. PATTERSON. *Welding Journal,* Vol. 29, June 1932, pages 173-177. Discussion of paper presented before the Institution of Welding Engineers, London, Mar. 17, 1932 and published in *The Welding Engineer,* Vol. 29, May 1932. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 14. TEJ (11c)

Fusion Welding of Copper. (La Soudure Autogène du Cuivre.) *Revue de la Soudure Autogene,* Vol. 24, June 1932, pages 2535-2537. Abstract of booklet (La Soudure Autogène Oxy-acétylénique du Cuivre. Price: 6 frs.) which gives elementary principles of welding, studies of causes of failures, data on weldability and applications of oxyacetylene welding of Cu. FR (11c)

Engineers in Agreement on Ductility in Weld Metal. *Steel,* Vol. 90, May 9, 1932, page 36. Notes on number of papers presented at New York Meeting of American Welding Society, Apr. 27-29, 1932. Papers separately abstracted in *Metals & Alloys.* JN (11c)

Develops Revolving Electric Arc Saw to Cut Steel; Operation is Simple. *Steel,* Vol. 90, Apr. 11, 1932, page 36. Cutting wheel constitutes one electrode of this system and work, itself, serves as other electrode. Current of several hundred amps. is passed at low voltage while wheel is revolved at 1800 r.p.m. In this way, a new and cool surface is presented continuously towards the work. JN (11c)

Fusion Cutting and Welding Torch for Low Temperature. (Autogen-Schneid- und Schweissbrenner für niedrigere Temperaturen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Jan. 15, 1933, page 38. A special type of blow pipe, patented by the German Dye Trust, is described in which air is injected into oxygen-acetylene mixture in order to decrease temperature on torch tip. Torch is particularly suitable for welding metals of low melting temperature such as Al, Zn, Pb, etc. GN (11c)

Time Studies on Manufacture of Wrought Iron Rings Made by Forging, Cutting and Welding. (Zeitvergleich für Schmieden, Brennschneiden oder autogenes Schweissen schmiedeeiserner Ringe.) *Zeitschrift für Schweisstechnik,* Vol. 22, July 1932, page 187. Further tests on manufacturing time of Fe rings. EF (11c)

Welded Frame for Sulzer Diesel Engines. (Geschweisste Ständer für Sulzer Dieselmotore.) *Zeitschrift für Schweisstechnik,* Vol. 22, July 1932, pages 185-186. The ideas of the designer incorporated in the huge welded frame of the latest Diesel engines are fully outlined. The frame is entirely built of steel plates and profiles. EF (11c)

Large Diameter Welded Gas Lines Completed. *Welding,* Vol. 3, Oct. 1932, pages 593-596, 602. 210 mile, 26″ diameter natural gas line laid in California required 30,199 welds and 135,895 lb. welding rod. Both electric arc and oxy-acetylene welding were used. TEJ (11c)

Heat Stresses in Welds and Their Effect on Safety of Constructions. (Wärmespannungen bei Schweissungen und ihr Einfluss auf die Sicherheit ausgeführter Konstruktionen.) F. Wörtmann & W. Mohr. *Schweizerische Bauzeitung,* Vol. 100, Nov. 5, 1932, pages 243-246. When good electrodes are used heat stresses do not endanger construction. Rules are given for reducing heat stresses. Amount of metal per layer should be small; it is better to finish a weld in several layers. Heat stresses may become dangerous (1) when elongation of material is practically exhausted by shrinkage upon welding (poor electrodes, unfavorable arrangement and shape of seams) (2) when notches or weak areas which may act as notches are present. In these cases the stresses are the more dangerous the further they reach, i.e. the more elastic deformation work is stored up. Superelastic deformation work is not detrimental to safety of completed structure. To account for danger of heat stresses it is necessary to measure (1) how far away from seam they are (2) to what extent material was fused near seam. From these measurements elastic deformation still present can be calculated and it can be determined whether or not an additional external load may cause fracture at weak areas. Stress measurements with tensometers have only scientific values; no conclusions can be drawn as to safety of construction. Slight plastic deformation near weld seams is not a fault; it rather proves that seam is strong enough to stand loads beyond elastic limit. GN (11c)

Welding Practice. A. G. Walker. *Iron & Coal Trades Review,* Vol. 126, Jan. 6, 1933, page 5. Essentials of good welding, modern practices and trends are briefly discussed and reviewed. Ha (11c)

Welding of Commercial Chassis in an Austrian Plant Effects Savings with Lighter Frames. *Automotive Industries,* Vol. 67, Oct. 8, 1932, pages 447-448, 457. Transcription of a paper published by Novac Ferdinand and entered in competition by same writer for the Second Lincoln Arc-Welding Prize, Lincoln Electric Co. Welding of automobile frames on a small-scale production basis is viewpoint of paper. Results may be tabulated as follows:

Total Cost Per Frame Including Tool and Die Costs

No.	Riveted %	Welded %	Cost Reduction by Welding. %
1 frame	100	11	89
10 frames	100	40	60
100 frames	100	59	41
200 frames	100	60	40

DTR (11c)

Welded Switch House at Central Railroad Station Dresden. (Geschweisste Stellerei auf Hauptbahnhof Dresden.) Weiss. *Organ für die Fortschritte des Eisenbahnwesens,* Vol. 87, Mar. 15, 1932, pages 131-132. Reports on construction job utilizing welding for structures and bolting for connecting parts. Critically discusses drawbacks of welding in regard to over-head welding difficulties and lining up erected structures. Asserts that screwed joints are often more economical if joints are made. EF (11c)

Arc-Welding with Alternating or Direct Current. (Lichtbogenschweissung mit Gleichstrom oder Wechselstrom.) F. Rosenberg. *AEG-Mitteilungen,* Sept. 1932, pages 308-312; *Die Werkzeugmaschine,* Vol. 36, Nov. 30, 1932, pages 420-421. Characteristic differences between the d.c. and a.c. arc are explained; due to alternating character, passing through zero, special means to obtain same steadiness as in d.c. arc must be applied which can be best attained by welding transformer with power factor of between 0.25 and 0.5. Arc is better maintained by covered electrodes which also have advantage of producing welds of better quality. Characteristic curves of d.c. welding generator and a.c. welding transformer are compared. GN + Ha (11c)

Fusion Welding as Related to Steel Castings. T. S. Quinn. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 269-292; *Iron & Steel Industry & British Foundryman,* Vol. 6, Nov. 1932, pages 51-53; Jan. 1933, pages 157-161. The author gives detailed data from 15 sources, in addition to his own data, on the physical properties of welds of carbon and alloy steel castings using the arc method, the oxy-acetylene method and the atomic-hydrogen method. Satisfactory welds can be made by all of these methods. A considerable variation in the results produced by different welding rods is noted. Coated rods are much more satisfactory than uncoated rods. There is an increasing dependence on the bend test for determining the ductility of welded joints. Illustrations of welding applications are shown. CHL + VVK (11c)

Arc Welding Sheet Metal. E. P. Bestler. *Sheet Metal Industries,* Vol. 5, Apr. 1932, pages 853-855. Paper before American Welding Society (Chicago Section.) See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 40. AWM (11c)

Built-up Arc Welding of Street Car Rails in Relation to Rails, Welding Material and Welding Method. (Auftragsschweissung mit dem Lichtbogen bei Strassenbahnschienen in Abhängigkeit von Schienen, Zusatzwerkstoff und Schweissart.) W. Hoffmann. *Verkehrstechnik,* Vol. 48, Jan. 2, 1931, pages 6-8. Adaptability of various grooved rails for built-up welding, most commonly used material and resulting Brinell hardness numbers are discussed. Accomplishment of built-up welding operation is described at length and experimental results of investigations into temporary and permanent dimensional changes measured on grooved rails of various composition are reported. A great wealth of data is compiled in tables. Great advantages of high Mn-steel rails are emphasized. EF (11c)

Possible Applications of Electric Welding in Container and Boiler Construction. (Anwendungsmöglichkeiten der elektrischen Schweissung im Behälter- und Dampfkesselbau.) H. Strössner. *Die Wärme,* Vol. 55, Oct. 15, 1932, pages 721-725. Characteristic features of resistance and arc welding are outlined and their utilization with reference to pressure vessel manufacture is demonstrated by many practical examples. Automatic welding and Arcatom welding are dealt with separately. EF (11c)

Remarks on the Application of the "Rules for Welded Steel Constructions" with Examples. (Ausführungen über die Anwendung der "Vorschriften für geschweisste Stahlbauten" mit Beispielen.) Hans Schmuckler & Kommerell. *Elektroschweissung,* Vol. 3, Jan. 1932, pages 14-16. Discussion of some points of the previous paper by Schmuckler in *Elektroschweissung,* Vol. 2, July 1931, pages 127-139; Aug. 1931, pages 148-150. See *Metals & Alloys,* Vol. 4, May 1933, page MA 149. GN (11c)

The Radiographic Examination of Welds. R. A. Stephen. *Welding Journal,* Vol. 29, Oct. 1932, pages 299-303. Paper read before the members of the Institution of Welding Engineers, Oct. 19, 1932. The author explains the use of X-rays in the examination of welded seams and suggests that the American practice of radiographing all the welds in pressure vessels be adopted. In shipbuilding and civil construction work the effect of even occasionally checking the quality of the work of operators by a non-destructive test is of the greatest importance. TEJ (11c)

Arc Welding of Electric Locomotives. (Lichtbogenschweissung an elektrischen Vollbahnlokomotiven.) R. Spies. *Elektroschweissung,* Vol. 3, Dec. 1932, pages 221-224. Electrically welded parts of electric locomotives proved highly successful though they are subjected to considerable mechanical strain by vibrations. 2 types of German electric locomotives are described. Among parts welded are frames and many parts of electric outfit, such as gear boxes, oil vessels of oil-cooled transformers, bearings of driving motors, air pumps for brakes, ventilating system, etc. Experiences in Austria and America are considered. GN (11c)

Electric Built-up Welding of Street-car Rails. Recent Acknowledgments and Experiences. (Elektrische Auftragschweissung bei Strassenbahnschienen. Neue Erkenntnisse und Erfahrungen.) K. Tewes. *Verkehrstechnik,* Vol. 48, June 5, 1931, pages 283-284. Considers correlation of burning depth to chemical composition of welding rod and critically discusses previous statements of Hoffmann. EF (11c)

A Suitable Fusion Welding Method for Boiler and Container Construction. (Geeignetes autogenes Schweissverfahren für den Kessel-und Behälterbau.) H. Buchholz. *Die Wärme,* Vol. 55, May 28, 1932, pages 365-370. The more important sources of boiler defects are considered. Riveted and welded boiler joints are compared in regard to their physical properties. The fusion welding methods, i.e. left and right hand welding, are critically discussed. Latter is not only more economical, but also warrants greater safety and a better welding microstructure. Normal gas welded seams show an impact hardness of 2-3 mkg./cm.^{2}. Final superficial welding of seam underside is suggested. Boiler material had a tensile strength of 37 kg./cm.^{2} and an impact value of 24 mkg./cm.^{2}. Welding of underside of right hand welded V-seam is carried out by using a thin welding rod, torch is held at an angle of 80-90° when temperature drops below dark red (about 400° C.). Full cross section area of sheet is preserved, inhomogeneities at underside of V-seam are eliminated and impact hardness is materially raised. Writer says that seams with larger heating zones do not display larger internal stresses. EF (11c)

Metallurgy of Some Variables in Arc Welding. F. R. Hensel & E. I. Larsen. *Metals & Alloys,* Vol. 3, Nov. 1932, pages 250-254, 256. Presents data on metallurgical characteristics of weld metal including studies of composition, McQuaid-Ehn reaction of weld metal and its impact strength. Variables of welding operation which were studied in connection with their effects upon these metallurgical qualities were arc length, shielding, a.c. vs. d.c., welding all with bare wire, electrode coatings, and atmosphere in vicinity of Fe arc. N content of weld metal increased with arc length or voltage, 0.114% with 13 volts to 0.135% with 30 volts. Shielding in a 3″ deep hole 1″ in diameter decreased N pickup from 0.126% to 0.038% and decreased loss in Mn, Mn content of electrode 0.50%, weld metal without shielding 0.03%, with shielding 0.42. Using a.c. the Mn loss is much lower, particularly in the case of the Carbon arc where N pickup is only 1/3 that with d.c. Some data is presented on effects of slag formed and atmospheric control attained with coated rod. Abnormality in weld metal disappeared in case of coated rod but this appears to be on account of increased Mn and Si content of rod. Impact strengths of weld metal from 3 different electrode materials is shown graphically covering temperatures from —200° to 200° C. in aged and as received conditions. 16 references. WLC (11c)

Conveyorized Welding. W. R. Campbell & R. S. Taylor. *American Machinist,* Vol. 76, June 9, 1932, pages 721-725. Acetylene welding in the quantity production of refrigerators is described in detail. See also "Welding as Applied to the Electrolux Refrigerator," *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 12. TEJ (11c)

The Construction of Steel-framed Greenhouses. Ernest D. Chabot. *Welder,* Vol. 4, Sept. 1932, pages 26-32. See "How Welding Revolutionized a Fast Growing Industry," *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 13. TEJ (11c)

Weight and Cost of Steel Dies Reduced by Use of Gas Cutting and Welding. Everett Chapman. *Automotive Industries,* Vol. 67, Oct. 22, 1932, pages 531-532. With dies built up from steel plates there is no scrapping of castings or patching of flaws. Some interchangeability is available and salvage value is increased. Heavy plates are available in thicknesses up to 16″ and total weight as high as 55,000 lbs. These plates may be cut to any desired profile or sketch by means of the oxy-acetylene cutting torch. Thus there is at hand a material which is roughly 2½ times as stiff as material used in the past, a homogeneous material with no internal defects, which can be welded economically and whose price is that of rolling mill stock. DTR (11c)

Improved Methods of Oxyacetylene Welding Reduce Construction and Operating Costs. S. C. Clark. *Oil & Gas Journal,* Vol. 31, Sept. 29, 1932, page 80. Latest developments in the Lindeweld process of oxyacetylene welding such as new blowpipe and welding rod and consequent changed technique are discussed. VVK (11c)

Riveting (11d)

New Riveting Machine. (Neue Nietmaschine.) C. Züblin. *Schiffbau, Schiffahrt und Hafenbau,* Vol. 33, June 1, 1932, page 166. The new electric Eumuco riveting machine is suited for 45 mm. rivets and boilers of 1600 mm. diameter (max.) with a 7000 mm. max. length of riveted joint. The rivet snap head dies are exchangeable. The short heating and transporting times of the rivets are emphasized. WH (11d)

Cold Driven Rivets vs. Hot Driven Rivets. F. G. Thorn, Jr. *U. G. I. Circle,* Vol. 13, Nov. 1932, pages 19-23. Parallel tests made with rivets made of manufacturers' standard boiler rivet steel, hot-made and self-annealed, were better driven cold than hot due to increase of strength developed by cold-working. Shearing tests revealed a 76.5% higher elastic limit in cold than in hot driven rivets. Cold-driven rivet fills the hole better. Results are shown in graphs and tables. Ha (11d)

Riveting Machine for Airship Girders. (Nietmaschine für Luftschiffträger.) Carl Krömer. *Die Werkzeugmaschine,* Vol. 36, Oct. 15, 1932, page 357. Description of a machine for riveting ring and longitudinal girders of airships. Mode of operation is discussed in detail. GN (11d)

WORKING OF METALS & ALLOYS (12)

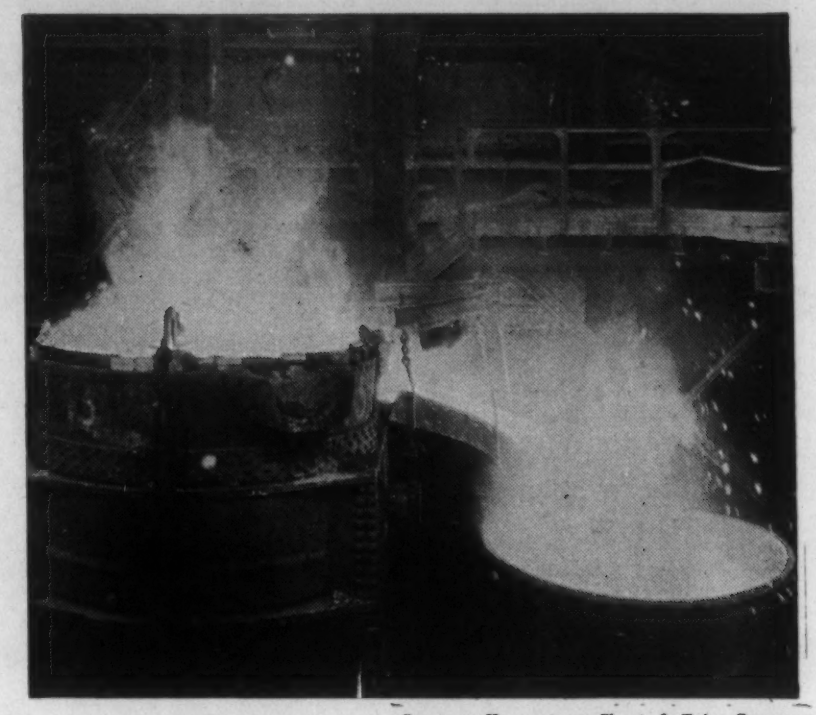
Melting & Refining (12a)

On Preparation of Aluminum Bronze. (Ueber die Zubereitung von Aluminiumbronze.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Nov. 27, 1932, page 480. Since these alloys show no transition zone between liquid and solid state the melt freezes rapidly and therefore necessitates special precautions in preparation in order to avoid pipes and porosity. These precautions are discussed. Composition varies widely, Al: 8.2-10.5%, Mn: 0-4%, Fe: 0-5.5%, Ni: 0-6.4%, balance Cu. GN (12a)

Stainless Production—Equipment and Method of Manufacture. E. C. Smith. *Yearbook American Iron & Steel Institute,* 1932, pages 185-238; *Engineering,* Vol. 134, Aug. 19, 1932, pages 227-228. Survey of methods of manufacture of Cr and Cr-Ni steels including direct reduction and ferro-alloy methods, arc and induction electric furnaces, characteristics of ingots, rolling and finishing of bars, sheets and strip. LFM + VVK (12a)

Production of High Quality Cast Iron by Superheating and Refining in the Induction Furnace of Normal Frequency (La Production des Fontes de Haute Qualité par Surchauffage et Affinage au Four à Induction à Fréquence Normale). A. Levasseur. *Revue Generale de l'Electricité,* Vol. 32, Sept. 24, 1932, pages 383-386; *Bulletin de l'Association Technique de Fonderie,* Vol. 6, July, 1932, pages 244-247. See *Metals & Alloys,* Vol. 4, June 1933, page MA 192. FR + Ha (12a)

Manufacture of Cr-Mo Steel in a Basic Open Hearth Furnace. A. Shevtshenko. *Domez,* No. 7, 1932, pages 33-38. (In Russian.) Satisfactory Cr-Mo steels were prepared in 5 and 30 ton basic open hearth furnaces. Specifications called for less than 0.04% P and 0.03% S. Fe used contained on the average 0.03% S and 0.2% P. A 50:50 iron-scrap charge was used to which 2% Mn ore was added. Slag was removed by letting it boil several times over the door sills. Fe-Mo additions must be made 1 to 2 hours before tapping. Fe-Cr added about 15 minutes before tapping. Its loss was around 40%. A very detailed description of heats is given. (12a)



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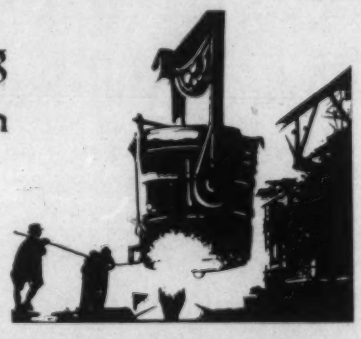

Equilibria between Metals and Slags in Melt. III. Equilibrium $2MnO + Si \rightleftarrows SiO_2 + 2Mn$. (Ueber Gleichgewichte zwischen Metallen und Schlacken im Schmelzflusse. III. Das Gleichgewicht $2MnO + Si \rightleftarrows SiO_2 + 2Mn$). W. Krings & E. Kehren. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Dec. 1932, pages 385-408. Ideal mass-law does not represent correctly the equilibrium in ternary system Mn-O-Si. The formula $KSi, Mn = \frac{(MnO)^2 : [Si]}{(SiO_2) \cdot [Mn]^2} = 0.113 \pm 0.025$ represents the equilibrium only for 1500° C. in the range of 0-60% SiO_2 in the slag, for higher percentages the constant decreases which seems very likely due to admixtures of MgO from lining or crucible while impurities of Al_2O_3 and ZrO_2 had no influence. An addition of FeO apparently did not influence the equilibrium. 10 references. Ha (12a)

Economic Melting in the Metal Foundry. (Sparsames Schmelzen in der Metallgiesserei.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 11, 1932, pages 499-500. In melting non-ferrous metals special precautions are to be taken to avoid oxidation to largest possible extent. Coke-fired Selve crucible furnaces built by Vereinigte Deutsche Metallwerke, Basse & Selve, Altena, Germany, is claimed to meet this requirement. GN (12a)

The 12-14 Percent Manganese Steel. (Der 12- bis 14 prozentige Manganhartstahlguss.) *Zeitschrift für die gesamte Giessereipraxis.* Vol. 53, Nov. 13, 1932, pages 452-453. Hard Mn steel is made either in basic open hearth or basic electric furnace, or in crucible when melts are small. 2 methods of melting in open hearth are discussed at length, particularly stressing ways of avoiding a heavy loss of Mn. Melting of Mn steel in electric furnace does not differ greatly from common practice. Charge, melting down and finishing of the heat are described in detail. Mechanical nick and break tests for judging the desired Mn content of the melt, physical properties of such steels, molding, gating, casting and annealing and finally application are considered. GN (12a)

Small Converters for Steel Foundry Work. J. H. Deschamps. *Iron & Steel Industry & British Foundryman,* Vol. 6, Dec. 1932, pages 79-80. Converter steel has certain characteristics which make it exceedingly useful in producing many castings. Author defends quality of converter steel stating that it gives best results of any steel when submitted to all standard tests. CHL (12a)

Hot Pearlitic Iron from Rotary Furnaces. Correspondence from F. Giolitti. *Metal Progress,* Vol. 21, June 1932, pages 60, 66. Good results are being attained with revolving furnace in melting of pearlitic Fe. Typical charge: 4000 lb. gray Fe turnings (C 3.5%), 6000 lbs. sheet scrap (0.22%C), 400 lbs. petroleum coke. When completely melted (4 hrs.) C content was 2.95%. After charging 300 lbs. 60% FeSi, and 120 lbs. FeMn the temperature was raised to 2900° F. and the metal tapped. Analysis: total C 2.98, combined C 0.88, Si 1.50, Mn 0.67, S 0.10, P 0.21. Shearing stress, 60,000; tensile 44,000; Brinell 269. Bend test on 8 × 10 mm. bar with 30 mm. span gave breaking loads of 920 kg. and deflection between .24 and .27 mm. WLC (12a)

Electrical Engineering Problems in the Construction and Operation of Electric Furnaces. (Elektrotechnische Probleme im Elektrofenbau.) Reinhold Gross. *Elektrotechnische Maschinenbau,* Vol. 49, 1931, pages 942-946. Review with special attention to new high-frequency furnaces made by Siemens & Halske; a few melting schedules for electric steel are reproduced. Ha (12a)

Some Factors Affecting the Cleanliness of Steel Castings. C. H. Herty, Jr., C. F. Christopher & M. W. Lightner. *Transactions American Foundrymen's Association,* Vol. 3, Nov.-Dec. 1932, pages 444-460. Both careful choice of deoxidizers and preparation of heat for deoxidation are essential for uniform cleanliness and good physical properties of steel. Action of deoxidizers and elimination of non-metallic inclusions from bath are described in great detail. An hypothesis to explain action of Al in causing low ductility is offered. Low S appears necessary for consistent production of high ductility in Al treated steels. CHL (12a)

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Casting & Solidification (12b)

Hydraulic Process plus New Alloys widen the Field of Die Castings. Wm. J. During. *Product Engineering*, Vol. 3, Sept. 1932, pages 376-378. 3 methods of producing die castings, viz. mechanical, pneumatic and hydraulic, are briefly described; Zn die castings of intricate form are shown for variety of purposes. Ha (12b)

Non-Ferrous Metal Mould Castings. F. R. Francis. *Canadian Chemistry & Metallurgy*, Vol. 16, Dec. 1932, pages 299-300. Deals with type of castings produced by various methods. Alloys used in die casting are grouped as: (1) Sn-base alloys with Cu, Sb and Pb as alloying metals, (2) Pb-base alloys with Sb, and Sb and Sn as alloying metals, (3) Zn-base alloys with Cu and Al, (4) Al-base alloys with Cu, Ni, Si, Fe, Mn and Mg, and (5) Cu-base alloys with Al, Sn, Pb, Zn, Ni and other metals as alloying metals. Characteristics of each group are briefly discussed. Casting temperatures have been rising in recent years. WHB (12b)

Relation of Volume Changes by Diffusion to Inverse Segregation upon Rapid Freezing. (Volumenänderungen durch Diffusion im Zusammenhang mit der umgekehrten Blockseigerung bei rascher Erstarrung.) C. Haase. *Zeitschrift für Metallkunde*, Vol. 24, Oct. 1932, pages 258-261. Alloys which expand during freezing frequently show inverse segregation in ingot. Cu-Zn alloys 0-40 weight % Cu show pronounced inverse segregation and marked expansion on freezing, and were selected for study. Alloys with 2, 10, 15, 23, and 37 weight % Cu were cast and samples taken from sectioned ingots. These samples were annealed at progressingly increasing temperatures chiefly in solid + liquid range, quenched, and density changes on annealing determined. Alloys 2 and 37% Cu showed very little density change; maximum density decrease was found in 15% Cu alloy, at both sub-solidus and super-solidus annealing temperatures. Length changes following annealing proved more satisfactory than density determinations. Length remained essentially constant for 10% and 23% Cu alloys upon annealing below solidus but increased on annealing at higher temperatures; 15% alloy showed an increase in length at all temperatures. Segregation curves are given for ingots of alloys 10, 15, and 23% Cu, which show the 15% alloy to produce maximum inverse segregation. Process of inverse segregation is explained by an increase in volume during freezing, forcing the Zn-rich melt between the primary Cu-rich dendrites, thus enriching the outside layers in Zn. Inverse segregation in Cu-Zn alloys is compared with that in Sb-Bi alloys. RFM (12b)

Casting of Magnesium in Sand. (Fonderie du magnesium: coulée en sable à vert.) A. Caillon & R. de Fleury. *Comptes Rendus*, Vol. 195, Sept. 26, 1932, pages 549-551. To prevent attack of Mg by water-vapor in casting following constitution of sand for molds is suggested: argillaceous sand, 10 parts; white sand, 30 parts; flower of sulphur, 0.4 parts; ammonium fluoride, 0.4 parts. Fluoride may be replaced by a mixture of ammonium sulphate and calcium fluoride. OWE (12b)

Aluminum Alloys—The Effect of Melting and Pouring Temperatures. Edmund B. Thews. *Canadian Chemistry & Metallurgy*, Vol. 16, Dec. 1932, pages 278-280. Chief factors influencing pouring temperatures of Al alloys are: (1) composition of alloys, (2) type, size and shape of molds, and (3) method of pouring. Where accurate pouring temperatures must be maintained to produce castings of definite mechanical properties, it is best to pour no more than 3 castings from 1 pan, or to reheat metal in pan or crucible for a few minutes after filling first part of a series of molds. Effects of hot and cold pouring are noted. It is practically impossible to neutralize ill-effects of burning by cooling the melt down to pouring temperatures or even undercooling. WHB (12b)

Rolling (12c)

Development of Cold-Rolling Mills. (Entwicklung der Kaltwalzmaschinen). Wilhelm Fass. *Stahl und Eisen*, Vol. 52, Dec. 22, 1932, pages 1261-1270. Includes discussion. A series of different designs of cold-rolling mills for cold rolling strips or bands is described and compared regarding stresses during rolling and prices. Ha (12c)

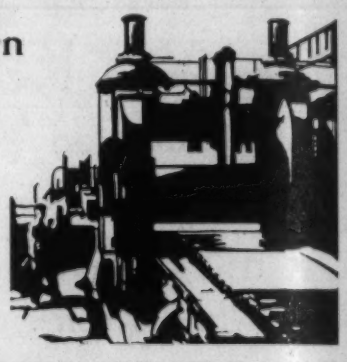
Novel Methods to Determine the Pure Rolling Energy. (Neuartige Verfahren zur Ermittlung der reinen Walzarbeit.) O. Emicke, H. Allhausen & W. Mauksch. *Siemens-Zeitschrift*, Vol. 12, Oct. 1932, pages 341-346. 2 instruments have been developed which permit measuring pure energy which is transmitted in rolling processes directly from rolls to rolled material, i.e. torsion-dynamometer and pressure-box. Former measures the torque on a coupling spindle between roll drive and roll stand; product of torque x angular velocity x time is energy consumed in that time, but losses of running idle, though very small, can be taken into account. Both dynamometer and pressure-box are built in the form of condensers, capacities of which change with load due to changed distance of plates. High-frequency instrument measures the change. Construction, electric circuits and several examples are described. Ha (12c)

Rolling in America and Europe. A. P. Chekmarev. *Domez*, No. 6, 1932, pages 6-15; No. 7, 1932, pages 49-56. (In Russian.) General plant layout became standard in U. S. so that all new installations follow same rule. Efficiency is excellent, particularly in teeming of ingots. In this respect U. S. is far ahead of Germany where handling of ladles with molten steel is very complicated. Machinery used is built with a much greater safety factor than in Europe. Germany leads in heat utilization which is somewhat slighted in U. S. Soaking pits in U. S. are usually heated and hold 4 ingots. In Germany half of them are without heating and usually they hold one ingot. A continuous heating furnace of one of European plants used for heating alloy ingots up to 2 tons is described in detail. It is coal fired and air is introduced in 3 places: under grate, above gas channels in front wall and through roof in middle part of furnace. Latter used for final combustion of gases permits an independent regulation of temperature of charging end. Minute description of heating practice in Germany is given. General survey of rolling mill installation covers practically all important mills in United States but none in Germany. (12c)

Keep Up With Modern Rolling Mill Practice

For cold rolling watch also Section 12j "Cold Working."

The Abstracts will help you



Forging (12d)

Dense Gear Forgings are Machinable and Durable. F. W. Cederleaf & W. E. Sanders. *Metal Progress*, Vol. 22, July 1932, pages 19-26. Report on research to determine cause of variations in machinability of gear forgings of uniform analysis, hardness, and microstructure. Deep etching of good and poor specimens revealed a low density in inferior forging as indicated by cavities and similar faults in microstructure. It was found that denser forgings could be produced by employing coarse grained steel, more accurate temperature control, and correctly designed dies. As a result of these changes in forging practice overall tool cost was reduced by 50%. Dynamometer tests indicated an increased year life of 50%. WLC (12d)

Causes and Decrease of Sand Spots in Heavy Forgings (Ursachen und Verminderung von Sandstellen in schweren Schmiedestücken). K. Daeves. *Stahl und Eisen*, Vol. 52, Nov. 24, 1932, pages 1162-1168. Inclusions of sand in forgings originate by action of Mn-O compounds contained in steel or refractory materials; their frequency of occurrence is closely related to composition of pig Fe used in manufacturing process and in type of latter. Statistical investigations of kind of sand spots show that they can be largely eliminated (1) by improving refractory materials in such manner that they are not attacked by Mn oxides, and (2) by preventing as much as possible formation of all Mn-oxides in steel during manufacturing process. Ha (12d)

Furnaces and Hammers for Forging Aluminum. J. B. Nealey. *Metal Progress*, Vol. 22, July 1932, pages 43-46. Description of gas fired furnaces, dies and steam hammers employed in forging Al alloys. WLC (12d)

Forging Dies Made from Master Types. R. H. McCarrol. *Metal Progress*, Vol. 22, July 1932, pages 38-40. Die typing as practiced by Ford Motor Co. consists of forcing a hardened master die into a die block heated to 1700° F. A master type is capable of producing from 200 to 400 forging dies. Type dies produce about 25% more forgings than die made in the usual manner. This increased endurance is probably due to extra work and grain flow at the working surface. WLC (12d)

Polishing & Grinding (12l)

Grinding of Metals and of Refractories. H. W. Wagner. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 39-43. The author presents a study of grinding requirements for metals and discusses the effect of properties of the metal being ground, the type of grinding refractory used upon the rate of removing stock, wheel life, finish, accuracy, and absence of injury by softening or cracking. Differences in the properties of refractories compared to metals are discussed as they apply to the problem of grinding such materials. WLC (12l)

Problems of Construction of Grinding Machines. (Aufgaben das Schliefmaschinenbaues.) K. Reinecker. *Zeitschrift Verein deutscher Ingenieure*, Vol 76, July 23, 1932, pages 725-728. Modern requirements for the satisfactory operation of grinding and polishing machines are discussed and their embodiment in modern machines illustrated and described. Ha (12l)

Lapping of Bevel Gears. (Ueber das Läppen von Kegelradflanken.) *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Aug. 10, 1932, pages 90-92. In the lapping machine of W. F. Klingelnberg Söhne, Remscheid, Germany, actual service conditions of the gears are simulated in that the gears are subjected to small oscillating motions. The machine is described in detail. GN (12l)

The Churchill Roll Grinding Machine. *Iron & Coal Trades Review*, Vol. 125, Aug. 19, 1932, pages 270-271. Description of machine for accurate grinding and cambering of rolls for finishing sheets and strips. Ha (12l)

Grinding Machines at the Leipzig Spring Fair 1932. (Schleifmaschinen auf der Leipziger Frühjahrsmesse 1932.) *Oberflächentechnik*, Vol. 9, Apr. 5, 1932, pages 67-71. Several new constructions, especially of fully automatic single and double grinders are described and illustrated. They include grinders for plane surfaces, for special shapes and for threads. Ha (12l)

FOUNDRY PRACTICE & APPLIANCES (22)

The Sagging of Long Machine Tool Beds, in Particular Lathe Beds. (Das Durchformen langer Werkzeugmaschinenbetten, insbesondere Drehbankbetten.) RUDOLF MARKER. *Die Giesserei*, Vol. 19, Sept. 2, 1932, pages 348-354. Charts and diagrams are developed which can be used in molding of very long pieces, such as beds of machine tools, in order to take into account deformations due to the effects of shrinking and greatly varying wall thicknesses of the casting, and also the length of the casting. The method is illustrated by an example. Ha (22)

Sand Drying. (Ein Beitrag zur Sandtrocknung.) HANS NEUMANN. *Sprechsaal für Keramik, Glas, Email*, Vol. 65, Feb. 18, 1932, page 117. Illustrated description of a unique sand drying oven of high thermal efficiency, used in a Russian plant. This is a shaft oven with cast iron angles in rows, arranged like a chess-board. The heating gases give off their heat direct to angles and sand so that high thermal efficiency is attained. GN (22)

Grain Size and Bond Distribution in Synthetic Molding Sand. A. H. DIERKER. *Transactions American Foundrymen's Association*, Vol. 3, July-Aug. 1932, pages 230-240. Bond distribution in molding sand is studied by the use of the microscope. The sample is immersed in refractive oil which causes the clay to stand out in relief, making it possible to determine its distribution satisfactorily. In this manner proper milling time for synthetic sand mixtures can be determined. Results of various attempts at measuring surface area of sand grains are given and discussed. CHL (22)

Rapid progress in casting metals calls for superior foundry control

Is your department keeping pace with 1933 operating methods?

Read these abstracts and be well informed. Sections 12a on "Melting and Refining," 12b on "Casting and Solidification" and 23 on "Furnaces and Fuels" also contain information of value to you.

Sea Coal Affects Permeability of Molding Sands. WALTER M. SAUNDERS & WALTER M. SAUNDERS, JR. *Foundry*, Vol. 60, Jan. 15, 1932, pages 29-30. Abstract of paper read at the Chicago Convention of the American Foundrymen's Association. See "Effect of Heat on the Permeability of Sea Coal Facing Sands and Core Sand Mixtures," *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 255. VSP (22)

Art Casting in the Iron Foundry. (Kunstguss in der Eisengiesserei.) M. ZADEMACK. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Aug. 7, 1932, page 310. The paper stresses the importance of proper molding sand for art castings. Molding with gypsum patterns is discussed. GN (22)

Foundry Factors Affecting Steel Casting Design. K. V. WHEELER. *Transactions American Foundrymen's Association*, Vol. 3, July-Aug. 1932, pages 125-152. Some basic reasons why costs and quality are unavoidably affected by design are pointed out. Effects of shrinkage and volume contraction are discussed in detail. Several illustrations show the effect of the various factors affecting design. CHL (22)

The Molding of a Hydraulic Cylinder of 22 tons and 10 m. length. (La Mode et le Moulage d'un Cylindre Hydraulique de 22 tonnes, de 10 mètres long.) WISTERZEE. *Revue de Fonderie Moderne*, Vol. 26, June 25, 1932, pages 211-212. Detailed description of the procedure of molding of the cylinder which was cast vertically. Ha (22)

Cast the Over Iron in Molds. (Giesse das Abfalleisen in Kokillen aus.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, May 15, 1932, pages 196-198. Discussion of the advantages derived from the casting of the remaining parts of iron melts in molds. Description of tilting molds. GN (22)

Green-Core Moulding. A. ZANKL. *Foundry Trade Journal*, Vol. 46, June 2, 1932, pages 323. An extended abstract of an article published in *Die Giesserei*. See "An Example of Application of Molding of Green Sand Cores," *Metals & Alloys*, Vol. 3, Nov. 1932, page MA 333. OWE (22)

Construction of a Mixing Machine for Facing Material. (Selbstbau einer Schwärze-Mischmaschine.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 16, 1932, pages 412-414. Detailed description. GN (22)

Processing of a Copper Container. (Die Herstellung eines Behälters aus Kupfer.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Sept. 4, 1932, page 357. Molding practice for a Cu container, length 1100 mm., width 900 mm., flange width 68 mm., thickness of flange 28 mm., weight 206 kg. GN (22)

Shrinkage of Pulleys and Fly Wheels. (Retrait des Poulies et Volants.) TECHNICAL COMMITTEE OF BELGIAN FOUNDRY ASSOCIATION. *La Fonderie Belge*, Vol. 2, Apr. 1932, pages 63-65. This work is the continuation of that presented at the Paris Foundry Convention (1931). Method described in previous paper is suitable. Results are given in 7 tables and 2 diagrams (Compression and tension strains in different parts of castings). No practical conclusions can be now drawn, the subject requiring further study. FR (22)

Efficient Mass and Single Production of Cylindrical Cores. (Rationelle Massen- und Einzelherstellung von zylindrischen Kernen.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Sept. 11/18, 1932, page 375. Description of the making of cylindrical cores in the rotating core making machine system, Küstner, Dresden. Up to 150 m. of smooth, permeable and durable cores of circular, square and oval cross-section can be processed by the machine. The machines are equipped with interchangeable drive for the various sizes. GN (22)

Do not always blame the Pattern Maker when the Pattern is to be located differently in the Parting. (Gebe nicht dem Modellbauer immer die Schuld, wenn das Modell nach deinen Wünschen anders in der Teilung liegen soll!) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Sept. 4, 1932, pages 355-357. Using as an example the table of a hack-saw the difficulties arising in making the proper parting of the pattern are discussed. GN (22)

Manufacture of a Hydraulic Plunger. (Herstellung eines hydraulischen Zylinders von 15000 kg. Gewicht.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 30, 1932, pages 441-444. Core making, molding and casting are discussed in detail. GN (22)

Making the Sweep and Mold of a Split Turbine Cover. (Herstellung der Schablone und der Form zu einem zweiteiligen Turbinendeckel.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 16, 1932, pages 422-424. Detailed discussion of the procedure. GN (22)

Molding and Casting of Hard Lead Castings. (Formen und Giessen von Hartblei-Gussstücken.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 16, 1932, pages 419-420. Special points to be observed in molding and casting hard Pb parts. GN (22)

Casting of Slide-Valves and Valves with oblique Seat made of Red Brass. (Das Giessen von Schiebern und Schrägsitz-Ventilen aus Rotguss.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 16, 1932, pages 417-419. Deals with pattern making, molding, cores, gating, melting and casting of above mentioned valves. GN (22)

Casting of Bushings in Bronze and Brass. (Das Giessen von Buchsen in Rotguss und Messing.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 30, 1932, pages 436-438. Discusses molding, gating, facing, cores, casting and removing of bushings from the mold. GN (22)

B.P.H. Pig Irons. Various Grades and Their Uses. *Commonwealth Engineer*, Vol. 20, Dec. 1, 1932, pages 141-142. Brief account of properties of pig irons for foundry use made by Broken Hill Pty. Co., Ltd., Australia. WH (22)

Producing Castings for Dry Process Enameling. *Better Enameling*, Vol. 3, Jan. 1932, pages 16-19, 37-39. Fundamental discussion of foundry equipment and practice for making castings such as sanitary ware or kitchen sinks. CBJ (22)

Cast Iron with Low-Carbon Content and Special Irons. *Foundry Trade Journal*, Vol. 47, Aug. 4, 1932, page 60. A brief discussion of the production of cast Fe of low-C content and special irons. Conclusion reached that the foundryman in the not far distant future will regard the cupola as obsolete and will have installed in his foundry either fuel-oil or pulverized-fuel-fired furnaces. OWE (22)

A Record Oil-Sand Core? *Foundry Trade Journal*, Vol. 47, Aug. 25, 1932, page 110. A brief reference to an oil-sand core weighing 11,000 pounds, for building into a mold for a large, horizontal, boring machine casting. OWE (22)

Coal Dust Firing for Foundry Melting Furnaces. (Kohlenstaubfeurung für Giessereischmelzöfen.) E. BECKER. *Feuerungstechnik*, Vol. 20, July 15, 1932, pages 107-108. Powdered coal checked the advance of oil firing in German foundries. The Brackelsberg furnace fired with coal dust equals the electric furnace in metallurgical regard but is superior with reference to initial and running expenses. Due to an installation of a recuperator, the working temperature of the former "cold" Brackelsberg furnace is raised from 1500° to 1800°-1900° C. Powdered coal or lignite with 10% moisture and 12-14% ash content can be utilized. The fuel consumption with reference to the output is 12-15% for cast Fe, 17-22% for malleable pig Fe and 20-25% for cast steel. For tilting, a 3 h.p. motor is used and 12 h.p. for producing the blast. The gas absorption and oxidation are remarkably low, resulting in a waste of only 1%. The Fe content of the slag is about 0.15%. The slag is removed after casting, the Fe being thinly liquid. Due to the absence of gases, no blow-holes and pipes occur. A 2.5% C Fe yielded 30 kg./mm.^{2} tensile strength. No difficulties are encountered in melting Fe low in C. Considerable quantities of scrap Fe can be utilized and in case of cast steel, the C content can be re-adjusted through the agency of petrol coke. FeO is readily reduced by Si and Mn without boiling. Due to its being thinly liquid and owing to the favorable casting properties, objects with rather thin walls can be easily made. The following data on a 0.79% C, 0.62% Si and 0.48% Mn steel are reported: tensile strength = 84.2. kg./mm.^{2}, impact hardness = 1.4-3.8 kg.-cm.; elongation = 10%, reduction of area = 19.8%. EF (22)

Contribution to the Study of Expansion of Sand Molds and Cores. (Contribution à l'Etude de la Dilatation des Moules et Noyaux en Sable). J. VARLET. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, July 1932, pages 275-284. Belgian exchange paper read before the World Foundry Convention, Paris, 1932: There are many studies dealing with expansion of foundry sands but the author is not aware of studies concerning expansion of molds or cores. However the question is of the utmost importance as expansion of cores, for instance, can appreciably lessen the useful thickness at the end of a long hollow casting such as a cylinder. If the ends of a long core are rigidly set in position, expansion can cause distortions of the core and even local breaking of sand which produces scabs leading to defective castings. Measurements were made on various mixtures of sand, dung, pulverized coke, cupoline (Belgian product). With heating at 1000° C., expansion of mixtures varies from 0.55 to 1.60% and their permanent expansion, after cooling down to room temperature, varies between 0.20 and 1.60%. FR (22)

Considerations on Heredity Phenomena due to Introduction of Steel Scrap in Cupola Charges and on Means of Suppression of Inconveniences caused by Those Phenomena. (Considerations sur les Phénomènes d'Hérédité dus à l'Introduction de Riblons d'Acier et sur les Moyens d'Obvier à ces Inconvénients.) *La Fonderie Belge*, Vol. 2, May 1932, pages 84-87. 2 cast irons produced by same melting furnace, having same chemical composition and being poured at same temperature, show considerable difference in their mechanical properties if charge mixtures are composed with variable proportions of scrap and raw pig irons. The greater the proportion of cast Fe and steel scrap, the finer the grain causing machining difficulties, the greater the tendency to shrink badly and the more difficult the correct pouring of castings. There is a proportion of steel which must not be exceeded in charges. This limit varies according to the melting furnace. The greater the temperature and soaking period which can be attained the higher the limit. This limit is to be calculated for each kind of charge and furnace. Rotary furnaces heated by means of pulverized coal are very useful in this respect. Advantages of rotary furnaces are given. FR (22)

Processing of Pistons in Permanent Molds. (Die Herstellung von Kolben in Kokillen.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 2, 1932, pages 398-399. Molds are made either of Ni-steel or Ni-alloyed cast Fe of following composition: C, 3.20-3.40%; Si, 1.60-1.80%; Mn, .55-.75%; P, about .20%; S, 0.07-.12%; Ni, .5%. Cores are made of common core sand, highly permeable to air. Casting procedure is outlined, Al pistons being poured at a temperature of 720°-760° C. Instead of a sand core a 3-part Fe-mold may also be used. GN (22)

Notes on the Use of Rotary Furnaces in Ferrous and Non-Ferrous Foundries. (Notes sur l'Emploi des Fours Rotatifs dans le Domaine des Fonderies de Métaux Ferreux et Non Ferreux). *La Fonderie Belge*, Vol. 2, June 1932, pages 102-105. Rotary furnaces reach temperatures up to 1550° and 1600° C. which are needed for obtaining high strength low C cast irons. Those temperatures are necessary for good homogeneity and castability. Rotary furnaces can be applied in duplex process for treating cast Fe melted in cupola when output of foundries in high strength cast Fe is important. Direct melting with cold charges is advocated for small foundries. Heating of furnace by means of oil burners permits use of small units from 350 kg. to 2 tons in which a temperature of 1600° C. of metal tapped can be reached without any difficulty. These rotary furnaces are very useful for melting (a) high content alloy cast irons (16% alloying elements and even more). (b) White and black heart malleable Fe. Rotary furnaces heated by means of pulverized coal are preferred for larger units (3 to 10 tons). Rotary furnaces are also used for melting bronze scrap (recovery of millings and borings) without great loss of oxidizable elements and for refining pure Cu. They can also be applied in melting Al alloys (as well as for scrap recovery) and in melting enamels. Results on melting operations are given for the production of pearlitic cast Fe in a small unit of 1500 kg. FR (22)

Some Important Factors in Steel Molding. (Quelques Facteurs Importants dans le Moulage de l'Acier.) G. BATTY. *Bulletin de l'Association Technique de Fonderie*, Vol. 5, May 1932, pages 163-166. A summarized translation. See "The Most Potent Variable," *Metals & Alloys*, Vol. 2, Aug. 1931, page 150. FR (22)

Foundry Cores and Core Binders. LAWRENCE E. BARRINGER. *Better Enameling*, Vol. 3, Feb. 1932, pages 27-28. Following requirements are necessary in a baked foundry core: ready workability, practical baking or hardening conditions, mechanical strength, permeability, smoothness of surface, heating resistance, and disintegration or collapsibility after casting is poured. Research has shown that alkyd resin type of synthetic resin possesses qualifications necessary for foundry cores. Foundry losses and cleaning costs have been reduced by use of this new binder. CBJ (22)

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FURNACES & FUELS (23)

The Induction Furnace and the Frequency Paradox. (Les Fours à Induction et le Paradoxe des Frequences.) A. Levasseur. *Revue Gènerale de L'Electricité*, Vol. 31 June 18, 1932, pages 827-831. A theoretical analysis of the performance of induction furnaces with and without Fe core shows that for constant voltage and for frequencies varying from 0 to infinite the secondary output always has a maximum, which for the furnace with magnetic circuit lies very close to 0. This explains the use of even lower than normal frequencies with this type of furnace, while in the coreless induction furnace the maximum occurs between 500 and 5000 cycles. Ha (23)

One-ton High Frequency Induction Furnace. *Iron & Coal Trades Review*, Vol. 125, July 29, 1932, page 163. The furnace is fed by a 2000 v., 500 cycle, 600 kw. single phase alternator. The full furnace charge of 1 ton can be melted in 1 hr. The installation is described briefly. Ha (23)

Globar Furnace. (Der Globarofen.) W. Miebach. *B. B. C Nachrichten*, Vol. 19, No. 4, July/Aug. 1932, pages 67-69. The Globar furnaces as built by the Brown Boveri Co. are described. The carborundum heating elements are made according to a special process and stand up to 1000 service hrs. when carefully supervised. The wiring system of automatic temperature regulator is shown and the regulator is described. Such furnaces are particularly suitable for heat treating tools and for the ceramic industry. Temperatures up to 1400° C. can be attained without difficulties with full maintenance of control accuracy. GN (23)

The Baked Carbon Electrode. (Die gebrannte Kohlenelektrode.) K. Tetzlaff. *Siemens Zeitschrift*, Vol. 12, Jan. 1932, pages 11-16. Data and information on production and consumption of electrodes; fields of application, dimensions and manufacture of very large electrodes are described. Ha (23)

The Most Favorable Utilization of Clear Furnace Space. (Ueber die gunstigste Ausnutzung lichter Ofenabmessungen.) Theodor Stassinet. *Stahl und Eisen*, Vol. 52, July 14, 1932, pages 686-690. A graphical and mathematical method for obtaining better utilization of clear furnace space is presented. In charging the pieces, the arrangement must be such that sufficient space is allowed for flow of hot gases. In a practical example of furnace operation, where the furnace space utilized was increased from 78 to 93%, the kw.-hr. consumption was decreased 8.7%. DTR (23)

Economical Regenerators for Open-Hearth Furnaces. (Wirtschaftliche Wärmespeicher für Siemens-Martin-Oefen). Trinius. *Archiv für Eisenhüttenwesen*, Vol. 6, Dec. 1932, pages 231-239. Includes discussion. From furnace performance, kind of gas and construction of furnace, heat-storage chamber is designed according to Rummel's method. An economical storage grate must use bricks suitable to different temperature zones. A simplified calculation of these temperature ranges and practical coefficients is given and methods of cost calculation for installation and construction of a storage chamber are developed. Value of heat recovered is determined and advantage of highly utilized waste gas by heat extraction is shown. Most economical shape of brick and kind of grating is discussed; non-staggered grate arrangement is preferable and brick should be as thin as practically permissible. In upper positions thick bricks must be used for durability. It is best to build a "multiple-zone grating" rather than a "single-zone grating." Distribution of waste gas to gas and air chamber is important for economic heat recovery 16 references Ha (23)

Recent Developments in Open-Hearth Furnace Design. R. A. Hacking. *Journal Society of Glass Technology*, Vol. 16, Sept. 1932, pages 293-314. Brief outline of trend of recent developments in regard to capacity, roof design, port-head design, water cooling devices, regenerative systems, automatic reversal and combustion control, and waste-heat boiler practice. Ha (23)

Practice and Aims in American Rolling Mill Furnace Construction. (Erfahrungen und Ziele im amerikanischen Walzwerksofenbau.) Hermann Bleibtreu. *Stahl und Eisen*, Vol. 52, Oct.13, 1932, pages 989-995. Discusses required characteristics of furnaces, kinds of burners, etc. Gives demands of modern furnaces and attempts of American practice to meet these requirements. Significance of heat insulation, temperature regulation and recuperator problems are discussed. Conclusions are drawn as to correct construction of furnaces and proposals are made for coöperation between plants and firms building furnaces. MGL (23)

Occurrences of Flow in Industrial Furnaces. (Über die Strömungsvorgänge in Feuerungen und industriellen Öfen.) Adolph H. Brandl. *Doctor thesis, Technische Hochschule Aachen*, 1932, 18 pages. Theoretically discusses flow of gases in industrial furnaces. Practical tests on speed and temperature distribution of gas flows and pressure losses through friction were made on rolling mill pusher-type furnaces. Results show that speed distribution of gases in such furnaces is rather similar to flow of cold gases. Dislocation of maximum speed towards furnace arch is due to local roughness. A remarkable effect of internal buoyancy of gases on temperature distribution could not be found. Heat transfer could be improved by installing a lateral burner so that maximum temperatures were near top of material heated. Measurements during holding periods show equalization of large temperature difference in flowing gases. From data measured, friction pressure losses were calculated; they are about 2-3 times larger than results from Fritzsche-Brabbé formula. A formula for friction losses is given which takes into consideration relative coarseness. Practical conclusions are drawn from the results. 28 references. GN (23)

Heat Used in a Pusher Furnace with Different Charges and Temporary Requirements. I. Measurements and Plant Instructions. (Warmeverbrauch von Stossöfen bei verschiedener Belastung uud zeitlicher Beanspruchung. I. Messung und Betriebsanweisung.) Albert Herberholz. **II. General Results for Periodic Furnace Management. (II. Allgemeine Folgerungen für periodischen Ofenbetrieb.)** Kurt Rummel. **III. Supplementary Measurement of the Relation between Heating Requirements and Stopping. (III. Ergänzende Messungen über die Beziehungen zwischen Anheisverbrauch und Stillstandzeit.)** Carl Arnold. *Stahl und Eisen*, Vol. 52, Nov. 10, 1932, pages 1094-1096; Nov. 17, 1932, pages 1118-1121. Herberholz gives a method for a diagrammatic representation and control of differences of specific heat requirements in cold and hot charges as well as related directions for furnace workers. Heating times for different periods of stopping, course of corresponding gas requirements and cooling and heating temperatures are discussed. A continued heating of rolling mill furnaces with by-product gas is not recommended ordinarily on an economic basis. An accurate daily supervision of gas requirements is possible and advisable not only for operating gas but also for heating gas. Such supervision causes a saving of 6000-40,000 RM/year. Rummel considers mathematically and technically determined measurement of accumulator heats of furnaces and boilers. It is expedient to erect furnaces with operating times $<$ 24 hours with thick walls, but to provide furnaces that periodically cool entirely with thin walls. For both cases directions are given for keeping down heat losses. On a basis of figures obtained by investigation, Arnold relates theoretical heating requirements and times to duration of stopping. Advantage of such budgeted gas and time requirements outweigh the disadvantages. MGL (23)

Diffusion Combustion in Forge Furnaces. H. M. Heyn. *Heat Treating & Forging*, Vol. 18, July 1932, pages 431-432. See "Forge Furnaces Improved by Diffusion Combustion," *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 87. MS (23)

Temperature Non-Uniformities in Heat Treating Furnaces due to Radiation from Charge. R. A. Ragatz & O. L. Kowalke. *Fuels & Furnaces*, Vol. 10, Sept.-Oct. 1932, pages 543-544, 548. Distribution of temperature in a carburizing furnace was determined. Although empty furnace had a fairly uniform temperature great temperature gradients were found with charge in place due to its radiation. Better arrangement of muffles and placing heating elements near the door gave a satisfactory uniformity. Ha (23)

Classification of Industrial Furnaces. F. H. Norton. *Fuels & Furnaces*, Vol. 10, July-Aug. 1932, pages 443-452. Classification is attempted on basis of fuel used, relative size of furnaces based on number of bricks used, continuous or intermittent operation and temperature. Ha (23)

Factors Affecting Thermal Efficiencies of Ovens. C. F. Mayer. *Fuels & Furnaces*, Vol. 10, May 1932, pages 349-352, 358. Importance of good joints in construction of furnaces is pointed out and practical formulas for determination of heat losses through them are developed. Ha (23)

The Stein Suspended Furnace Roof. Construction that Facilitates Repairs. *Foundry Trade Journal*, Vol. 47, Sept. 15, 1932, page 160. A description of a roof which has been designed mainly with a view to simplify insulation by using standard insulating slabs or insulating powder. In Stein construction alternate blocks of refractory materials are supported by round steel pins passing through holes which are formed through the centers of blocks towards their upper extremities. This form of construction eliminates local stresses in the furnace roof. OWE (23)

Principles of Recuperation Applied to Industrial Gas Furnaces. E. A. Luscombe. *American Gas Journal*, Vol. 137, Dec. 1932, pages 9-12, 29. More complete information can be found in Laboratory Report No. 685, "A Study of the Characteristics of Burning Gas with Preheated Air" Industrial Gas Research, American Gas Association. Study of heat balance of an industrial furnace shows that a considerable portion of total heat supplied is carried away by flue gas. Methods for reclaiming sizable quantities of heat include the use of preheaters, waste heat boilers, economizers, regenerators, and recuperators. Heat and corrosion resistant materials and alloys are recommended for construction of recuperator elements, air lines and burner tips, since Fe or mild steel oxidize rapidly in contact with air above 800° F. 14 references. CBJ (23)

Electric Resistance Furnaces. (Elektrische Widerstandsöfen.) *Demag Nachrichten*, Vol. 6C, Nov. 1932, pages 46C-47C; *Demag News*, Vol. 6C, Nov. 1932, pages 46C-47C. Describes recent constructions of electric furnaces for annealing, hardening, case carburizing, enameling and forging, crucible melting furnaces and soaking pits. Advantages of such furnaces are discussed, among which ease of control is mentioned particularly. GN (23)

Recent Improvements in Pressure Burners for Hot Blast Stoves. A. J. Whitcomb. *Freyn Design*, No. 10, Oct. 1932, pages 5-7. New improved designs of a stationary type of burner supplementing sliding type, of a new type of gas shut-off valve, and of electrically controlled combustion controller in place of hydraulic regulator are described in detail. Ha (23)

Electricity in Heating and Melting of Metals. A. G. Robiette. *Metallurgia*, Vol. 7, Jan. 1933, pages 79-81. Points out advantages of electricity. Due to high efficiency, electricity is cheaper than fuels for many jobs even though cost figured on an energy basis is higher. JLG (23)

Cracking of Anthracites as Dependent on Their Structure. B. Pines. *Domez*, No. 1-2, 1932, pages 41-47. (In Russian). For successful use in a blast furnace anthracite must have a fair resistance to pressure at elevated temperatures and must not crack when heated. Samples of 6 types of Russian anthracites were examined with X-rays. Inclusions observed were much larger in amount than supposed by analysis. Their distribution was either stratified or scattered. Heating pieces weighing about one kg. to 850°-900° C. for 10-45 min. and placing them in an Fe chill provided with lid showed that cracking occurs due to the presence of inclusions. Amount of chips flying off was not indicative of the behavior of samples at high temperatures. Thermal stability is major requirement of the fuel and distribution of inclusions as revealed by X-rays is a good index of this property. Conclusions were partially supported by actual blast furnace practice at Marioupol Works. (23)

Combustion of Pulverized Coal in Metallurgical Furnaces. Peter M. MacNair. *Foundry Trade Journal*, Vol. 47, Aug. 11, 1932, pages 85-86. Attention is directed to the following important factors in the combustion of pulverized coal: (1) unit vs. central system of pulverizing; (2) grinding fineness; (3) mixing of fuel and air (burner design); (4) preheating coal and air; (5) rapid ignition; (6) heat releases per unit volume; and (7) bituminous vs. anthracite coal. OWE (23)

Powdered Coal Fired Melting Furnace, Type Reitmeister. (Tiegelloser Metallschmelzofen, mit Kohlenstaubfeurung, System Reitmeister.) O. Beckmann. *Feuerungstechnik*, Vol. 20, Sept. 15, 1932, pages 136-139. Drawbacks of large combustion chambers for coal dust are criticized. In tilting Reitmeister Furnace, flame, tangentially entering furnace, rotates 2-3 times before being developed fully. Tests over a period of several years successfully included powdered lignite and coke. Air is preheated to 275° C. Various features of furnace and its auxiliary equipment are illustrated and described. A cost sheet is included showing a saving of 57% in comparison with the running expenses when oil is used. These data refer to German conditions, i.e. 1 kg. fuel oil = 12 Reichspfennig (about 3 cents) and 1 kg. of powdered lignite = 3.5 Reichspfennig (or less than 1 cent). EF (23)

Use of Pulverized Coal in Railroad Forging Work. *Iron Age*, Vol. 130, Sept. 1, 1932, pages 332-333. Discusses use of pulverized coal in heavy forging and metallurgical furnaces of Norfolk & Western Railroad at Roanoke, Va., which gives saving in fuel cost, marked reduction in scaling of metal, easily controlled temperature and longer life for furnace linings. VSP (23)

The Use of Powdered Coal in the Foundry. (L'Emploi du Charbon pulvérisé en Fonderie.) R. Moine. *Bulletin de l'Association Technique de Fonderie*, Mar. 1932, pages 75-82. Includes discussion. Lecture before Association Technique de Fonderie. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 357. FR (23)

Electrical Coking. (Verkokung auf elektrischem Wege.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Dec. 25, 1932, page 691. Stevens method as described in Walker's paper before 25th annual meeting of the Canadian Gas Association has a predecessor in the Röchling- Rodenhauser method which is described briefly. It has not yet found a practical application because costs are too high. GN (23)

Basic Principles of Coke Oven Control. E. V. Wirozub. *Domez*, No. 6, 1932, pages 37-46. (In Russian). Calculations show that proper regulation of Becker coking ovens must lead to a uniform coking period. (23)

Desulphurization of Metallurgical Coke. (Entschwefelung von metallurgischem Koks.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 15, 1933, page 40. Investigations by Britzke show that S in coke can be removed to a considerable extent by treating coke with Cl at 300°-1000° C. S content of 3 types of coke was decreased from 1.42% to 0.82%, from 2.15% to 1.37%, and from 1.92% to 1.45%. Result of treatment depends on nature of S compounds present in coke and on its porosity. GN (23)

The "Sesci" Melting Furnace. A Pulverized-Fuel-Fired Rotary Unit. *Foundry Trade Journal*, Vol. 47, Sept. 8, 1932, pages 135-137, 139. Description is given of "Sesci" melting furnace at foundry of National Gas Engine Company, Ltd., two of methods adopted for preparing fuel, three of firing technique and four of charging machine. OWE (23)

Melting Iron in Rotary Pulverized-Fuel-Fired Furnace. D. J. Reese. *Transactions American Foundrymen's Association*, Vol. 3, Nov.-Dec. 1932, pages 387-400. Pulverized-coal-fired rotary furnace originally developed for melting malleable cast Fe is used for melting various grades of cast Fe. Comparative costs are cited. Metal quality control and flexibility of operation are major advantages of this type of furnace. CHL (23)

The Use of Town's Gas in the Melting and Heating of Metals. J. C. Walker. *Metallurgia*, Vol. 6, Oct. 1932, pages 189-190. Points out advantages of city gas as compared with plant-made producer gas and coal. JLG (23)

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Present Status of Gas-Producer Construction and Operation in Steel Plants. (Der heutige Stand des Gaserzeugerbaues und-betriebes auf Hüttenwerken.) FRIEDRICH LÜTH. *Stahl und Eisen*, Vol. 52, Dec. 8, 1932, pages 1213-1221.
Present status and recent development of gas-producer construction in relation to operation of blast-furnace plants are reviewed. Coke, anthracite, lignite and briquetted lignite usually are gasified in producers with revolving grates and mostly with automatic charging equipment, securing uniform fuel supply. Gases produced hereby have an increased heating value. Load factor and time of operation are decisive for economy of gas plant; their influence is shown by a few examples from actual operation. Ha (23)

Commercial Evaluation of Coke. R. A. MOTT. *Gas Engineer*, Vol. 49, Jan. 1932, pages 13-15. A paper before the Institute of Fuel. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 357. WH (23)

Testing Coke by the Drop-, Barrel- and Pressure Abrasion Methods. (Prüfung von Koks nach dem Sturz-, Trommel- und Druckabriebverfahren.) GEORG SPECKHARDT. *Stahl und Eisen*, Vol. 52, Nov. 3, 1932, pages 1066-1070.
Testing different kinds of coke by 3 methods named showed that results are not related to each other. Test method should be selected according to desired quality of coke. Ha (23)

Coke in Metallurgical Melting and Heating Practice. R. J. SARJANT. *Metallurgia*, Vol. 7, Nov. 1932, pages 19-21. Discusses suitability of coke for various metallurgical operations. JLG (23)

Experiments on the Use of Peat Coke for Blast Furnaces. (Versuche über die Verwendung von Torfkoks im Hochofenbetrieb.) G. RANIKOW. *Feuerungstechnik*, Vol. 20, Feb. 15, 1932, pages 29-30. Peat coke can be used advantageously in blast furnaces if the size of the coke briquets is 25 mm. The composition of the furnace gases does not vary and CO_2 tested 4 times/hr. during a week always was between 16 and 17%. The coke consumption was 0.9/ton pig Fe. The average S content of the peat coke is 0.2-0.3%; resulting slag contains 0.05% S max. The experiments were carried out in a furnace previously run with charcoal. EF (23)

Performance of Theisen Disintegrators. C. G. BIGELOW. *Freyn Design*, No. 10, Oct. 1932, pages 15-16. Latest operating experiences are given with drum-type gas washers for secondary cleaning of tower-washed blast-furnace gas containing from 0.2 to 0.5 g. of dust/ft.^{3} and delivering clean gas ranging from 0.003 to 0.005 g./ft.^{3} Ha (23)

Flexibility in the Use of Blast Furnace and Coke Oven Gas in a Steel Plant. CHARLES R. MEISSNER & JULIUS H. STRASSBURGER. *Yearbook American Iron & Steel Institute*, 1932, pages 239-267; *Iron & Coal Trades Review*, Vol. 125, Aug. 5, 1932, page 200; *Engineering*, Vol. 134, Aug. 19, 1932, page 228; *Blast Furnace & Steel Plant*, Vol. 20, June 1932, pages 506-592.
Describes method now in use at Weirton Steel Co.'s plant at Weirton, West Va., of handling blast furnace and coke oven gases, through its ability to underfire coke ovens with either blast furnace or coke oven gas. Blast furnace gas is replaced at the boiler house with cheap slack coal releasing additional coke oven gas for finishing mill operations, displacing fuels that are higher in cost and more expensive to handle. The use of clean gaseous fuel in the finishing departments is of distinct advantage in producing steel of uniform quality. The use of blast furnace gas for underfiring involves no operating difficulties at the coke ovens, and, due to its long frame characteristics, produces a uniform good quality of coke. Amount of blast furnace gas required for coking compares favorably with results obtained with coke oven gas underfiring when based on heat units used per pound of coal charged. Utilization of coke oven and blast furnace gas in the mill operations should be so arranged that coke oven gas is used for long distance transmission and blast furnace gas for relatively shorter distances in order to avoid excessive pumping costs and too large an investment in pipe lines. Proper use of these 2 gases is a problem for each steel plant to solve for its own peculiar conditions in order to obtain the most economic and flexible operation possible. Detailed tabulations of this installation are included. Ha + LFM + MS + VVK (23)

Gas Power in the Iron and Coal Trades. F. JOHNSTONE TAYLOR. *Iron & Steel Industry & British Foundryman*, Vol. 6, Oct. 1932, pages 3-7; Nov. 1932, pages 39-42. Available power from blast furnace is equivalent to 33% of original heat in coke. Utilizing gas in internal combustion engines is most efficient means for making available this power. The gas from blast furnace containing 60% N_2, 29% CO and 10% CO_2 has an average dust content of about 5 g./m.^{3} Modern dry cleaners reduce dust content to 0.0025 g./m.^{3} The wet washers, dry cleaners and electrical precipitation process for gas cleaning are described. CHL (23)

Unique and Automatic Control of Temperature. Correspondence from FREDERICO GIOLITTI. *Metal Progress*, Vol. 22, July 1932, pages 51-52. Describes "Ungine Infra" self regulating induction furnace which is used extensively in Europe for heat treating operations requiring regulation of temperature within narrow limits over long periods of time. Temperatures ranging from 550°-2200° F. may be secured and maintained with a variation of only 2° or 3° F. by a proper choice of alloy used for the muffle acting as the transformer core. WLC (23)

Electric Furnace for the Heat Treatment of Large Pieces. (Elektro-Ofen zur Wärmebehandlung grosser Arbeitsstücke.) *Schweizerische Bauzeitung*, Vol. 100, Nov. 5, 1932, page 253. Brief description of a unique heating and hardening unit, composed of a vertically arranged electrically heated tube furnace, about 6.5 m. long, 1.6 m. in diameter. For quenching, a similar larger tube is arranged near the furnace. GN (23)

Electric Furnace Heating. GEORGE TURNER. *Metallurgia*, Vol. 7, Nov. 1932, pages 1-2, 4. Describes several "Russ" furnaces. JLG (23)

Development of the Electrode-Salt-bath Furnace. (Aus dem Werdegang des Elektroden-Salzbadofens.) E. SCHMIDT. *Elektrowärme*, Vol. 2, Nov. 1932, pages 253-258. Construction of containers for molten electrolytes, methods of igniting, wiring diagrams for different a.c. systems, regulation and temperature control and details of operation are described since inception of use of this method of case-hardening in 1903. Most modern furnaces reach a temperature of 1350° C. Salt-baths are particularly suitable for quick heating, and heated material is protected against attack by atmosphere when removed from bath, by a thin salt-film on surface. Salts most used are $BaCl_2$ for temperatures from 1000° to 1350° C., 3 parts $BaCl_2$ and 2 parts KCl for 750° to 1000° C., and KNO_3 and $NaNO_3$ in the ratio 1:1 for 200° to 400° C. Ha (23)

Lead-Bath Furnaces. S. Z. OWEN. *Electric Journal*, Vol. 29, Nov. 1932, pages 525-526. Temperature control and operation of pot type, electrically heated, Pb bath heat-treating furnace are discussed. CBJ (23)

New Fuel Fired Car-Type Furnaces Embody Latest Design Features. R. R. LAPELLE. *Steel*, Vol. 90, May 16, 1932, pages 27-29. A description of 7 gas furnaces at Ellwood, Pa., and 2 oil fired furnaces at Indian Orchard, Mass. These furnaces make use of a new method of firing, by supporting the charge above the actual car top level, and of a new method of temperature control which assures great uniformity and accuracy at temperatures between 400 and 1650° F. JN (23)

Hardening and Annealing Furnaces. (Härte- und Glühöfen.) *Maschinenkonstrukteur-Betriebstechnik*, Vol. 65, Nov. 10, 1932, pages 132-134; Dec. 10, 1932, pages 144-147; Jan. 10, 1933, pages 9-11. Description of gas and oil heated furnaces of latest German design for above purposes. Construction of burners and furnaces is shown. GN (23)

Greater Economy in Annealing and Hardening Furnace Construction. (Mehr Wirtschaftlichkeit im Glüh- und Härteofenbau.) SCHLAGENHAUFF. *Feuerungstechnik*, Vol. 20, Apr. 15, 1932, pages 53-54; May 15, 1932, pages 68-71. Author introduces his "Universal-Glüh- und Härteofen" which is intended to be used for (a) bringing longer bars up to temperature for stamping, rolling or bending purposes; (b) hardening and annealing of piece and bulk goods as well as hardening of required tools; (c) case hardening. The 2 story muffle furnace is fired by oil, consumption of which is 8 liters/m.^{2} hearth area. EF (23)

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REFRACTORIES & FURNACE MATERIALS (24)

Refractories for Industrial Furnaces. F. H. NORTON. *Fuels & Furnaces*, Vol. 10, June 1932, pages 383-392. Composition, manufacture and physical characteristics of refractories for industrial furnaces are discussed and a number of them tabulated. Ha (24)

A Refractory Material for Highest Requirements. (Ein feuerfester Baustoff für höchste Beanspruchungen. Geschichte einer Erfindung.) JUSTUS SCHMAUSER. *Tonindustriezeitung*, Vol. 56, Nov. 10, 1932, pages 1123-1124. The new refractory material Siemensite was developed from slag obtained in processing ferrochrome. It contains 20-40% Cr_2O_3, 18-30% MgO, and 25-45 Al_2O_3. Bricks of this material are cast in molten state. Since they tend to brittleness and cracks upon rapid cooling special forms of bricks were developed of which 24 types are shown. After casting, the bricks are tempered. The softening temperature of Siemensite is far above Seger cone 42, softening temperature under pressure above 1810° C. Such bricks show great stability against slags and are particularly adaptable to metallurgical furnaces working at very high temperatures and furnaces where the slag problem is important. GN (24)

Influence of the Manufacturing Conditions on the Properties of Magnesite Bricks. (Einfluss der Herstellungsbedingungen von Magnesitsteinen auf ihre Eigenschaften.) H. SALMANG & K. SCHNITZLER. *Berichte der deutschen keramischen Gesellschaft*, Vol. 13, Aug. 1932, pages 371-372. Abstract of paper before 13 annual meeting of Deutsche Keramische Gesellschaft, Sept. 25-27, 1932, at Berlin. Effect of various conditions of shaping and firing of magnesite bricks on their softening under pressure and resistance to thermal shock was studied. 3 types of raw magnesites and 3 shaping pressures (500, 1290 and 2200 kg./cm.2) were used. Values on softening under pressure found by former authors were too high. Stability against rapid temperature change was determined by decrease of compressive strength of magnesite cylinders after quenching. In some samples loss of strength amounted to 30-40%, but in 2 magnesite mixtures compressive strength decreased by only 7.6 and 5.6%. GN (24)

German Standards for Refractory Structural Materials. (Die deutschen Normen für feuerfeste Baustoffe.) ERNEST HERMANN SCHULZ & FRITZ HARTMANN. *Stahl und Eisen*, Vol. 52, Oct. 13, 1932, pages 995-998. A discussion of standards prepared up to 1932 for refractory structural materials, particularly in the iron industry. MGL (24)

Siemensite as Structural Material in Basic Open-hearth Furnace. (Siemensit als Baustoff im basischen Siemens-Martin Ofen.) JOSEF SITTARD. *Stahl und Eisen*, Vol. 52, Oct. 20, 1932, pages 1014-1017. Siemensite is a highly refractory material obtained from reduction melting in an electric arc furnace of chromite, bauxite and magnesite. It has proved to be serviceable and economical for use in the most dangerous parts of furnaces, such as burner tongues, front and back walls of furnaces. Results of melts in a furnace made of Siemensit are given. How far these experiences may be applied to other furnace conditions remains to be proved. MGL (24)

CO_2 and Refractory Bricks. (Kohlenoxyd und feuerfeste Steine.) *Feuerungstechnik*, Vol. 20, Feb. 15, 1932, page 29. In upper part of blast furnace, destruction of refractory bricks due to CO_2 has been observed. This phenomenon is ascribed to decomposition of CO_2 due to catalytic action of Fe. Fe in refractories forms carbides high in C which disintegrate again under C deposition. Continuous precipitation of C from CO_2 in the form of soot is the same reaction underlying the Aarts Process producing highly active C, called "Carbon-alpha." Manifestation of destruction depends on distribution of Fe in refractory material. Cracks or disintegration into small pieces or powder may take place. Usually "soot nests" appear which include Fe particles. Best temperature is 430°-470° C. Fe must be present as metal. Latter condition is easily fulfilled in blast furnace as Fe oxide is reduced at elevated temperatures. Use of refractory bricks which are low in Fe and fired at high temperature is urged. Bricks higher in SiO_2 are preferable to those higher in Al_2O_3 since Fe is more readily fixed due to lower sintering temperature. EF (24)

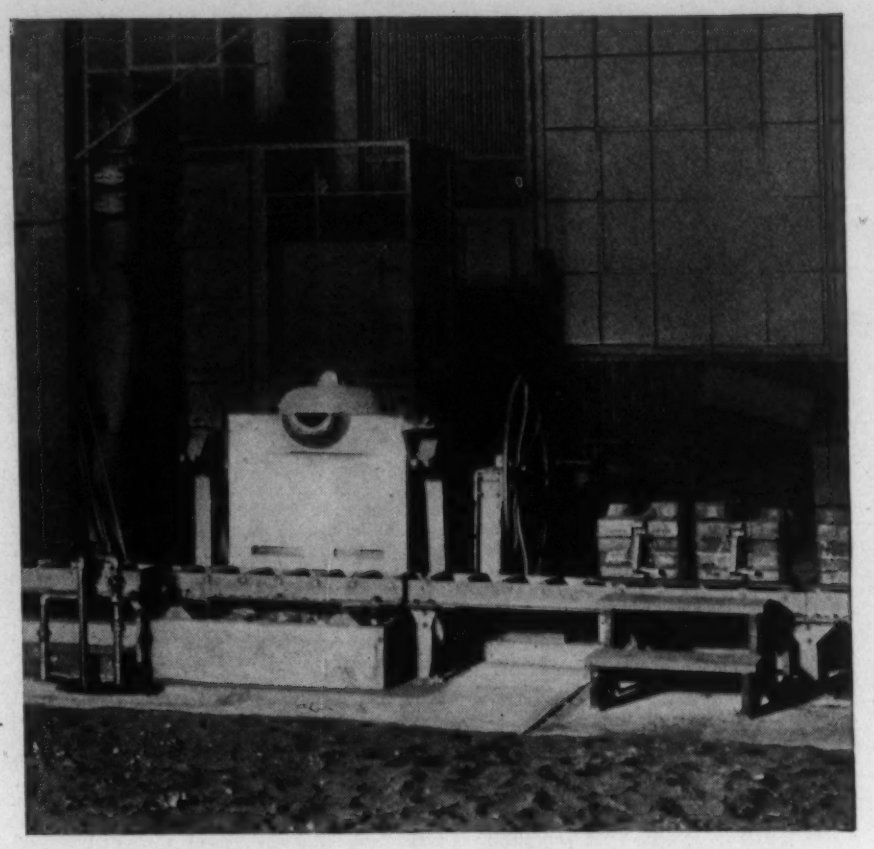
Manufacture of Chromium Bearing Refractory Material. (Über die Herstellung chromhaltiger hochfeuerfester Baustoffe.) *Feuerungstechnik*, Vol. 20, Aug. 15, 1932, page 127. Note on the Sprenger method of using the slags produced during the melting of Fe-Cr alloys for refractory material. The slag is enriched in Cr-oxide by using less C for the reduction of the Cr ores than actually required. The novel refractory material is said to have 15 times the life of the generally employed refractories in open hearth furnaces. EF (24)

Electric Resistance of Some Refractories at Elevated Temperatures. (Über den elektrischen Widerstand einiger feuerfester Stoffe bei hohen Temperaturen.) K. WERNER. *Feuerfest-Ofenbau*, Vol. 8, May 1932, page 70. In his Doctor Thesis, Werner investigated electrical conductivity of refractories which are preferably used as lining material in electric furnaces. Experiments include: SiO_2, Al_2O_3, MgO, CaO, fire clay, fire clay and SiO_2 with additions of fluxes and fired silicious acid hydrate. Electric resistance in ohm/cc. at 1600° C. of the densest body (all materials are tested in 4 different porous states) yielded following values: SiO_2 = 10800, Al_2O_3 = 5200, MgO = 1500, CaO = 1400, fire clay = 890. EF (24)

Experiments with Special Refractory Brick for Electric Furnace Roofs. (Versuche mit feuerfesten Sondersteinen an Elektroofen-Gewölben.) FRANZ SOMMER. *Stahl und Eisen*, Vol. 52, Sept. 15, 1932, pages 897-901; *Tonindustriezeitung*, Vol. 56, Oct. 17, 1932, page 1044. Report 236 of Steel Mill Committee of Verein deutscher Eisenhüttenleute. Includes discussion. In past year this Committee, dealing with electric steel practice, has gone into problem of substituting special refractories for silica brick in construction of crowns or arches of electric steel furnaces. This is a separate study from that involving the use of corundum, silicon-carbide and sillimanite. Present investigation deals with tar-dolomite and tar-magnesite mixtures and brick, and ribbed silica brick crowns. Test results thus far indicate that tar-dolomite as well as tar-magnesite brick are very poor substitutes. Tar-dolomite brick, better of the 2, prepared on a hydraulic rotating-table press, held up for only 10 charges, together with offering added metallurgical disadvantages. Tests with refractory carbon brick point out that excellent insulation against heat radiation is provided. However, saving in power to be expected as a result of better insulation is at best only equal to loss due to more frequent repairs to lining. With a ribbed design of silica brick crowns it was shown that a saving due to less amount of brick required was not large enough to overcome greater cost of power required. GN + DTR (24)

Graphite for Crucibles. (Über Tiegelgraphite.) WERNER FRÖHLICH. *Chemiker-Zeitung*, Vol. 56, Oct. 12, 1932, pages 809-810. Ceylon graphite is better than German and American for making crucibles. The ideal graphite is a coarse, slimy flake graphite with a sp. gr. of 2.015 to 2.2. The process of preparation is described. The advantages of using graphite in crucibles are that it raises the fusing point, if that is above 1600° C., reduces the coefficient of expansion, decreases the oxidation of the metal being melted and increases the thermal conductivity of the crucible. It also decreases the corrosion of the crucible by the metal. CEM (24)

Magnesite Refractories. P. F. BUDNIKOV & Z. YA. TABAKOV. *Domez*, No. 9, 1932, pages 24-31 (In Russian.) Description of preparation of magnesite and manufacture of bricks taken from published data. (24)



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NORTON REFRACTORIES

GASES IN METALS (25)

Removal of Gases from Aluminum Alloys by Mixtures of Nitrogen and Volatile Chlorides. J. D. Grogan & T. H. Schofield. *Metal Industry*, London, Vol. 41, Sept. 16, 1932, page 281; *Engineer*, Vol. 154, Sept. 30, 1932, pages 325-326; *Engineering*, Vol. 134, Sept. 30, 1932, page 394. Abstract of paper read before the Institute of Metals, Sept. 1932. See *Metals & Alloys*, Vol. 4 Mar. 1933, page MA 88. Ha + LFM (25)

The Gas Formation in Steels. (Zur Gasentwicklung in Stählen.) *Die Metallbörse*, Vol. 22, Apr. 9, 1932, page 450. Analyses of gases escaping steels in open-hearth furnaces are presented. Occurence of H_2 is discussed at length and influence of Si additions on liberation of gases is considered. EF (25)

Nitrogen Content of Some Standard-Sample Steels. J. G. Thompson & E. H. Hamilton. *Bureau of Standards Journal of Research*, Vol. 9, Nov. 1932, pages 593-595. N content of 4 standard samples of Fe and steel have been determined by both vacuum fusion and solution-distillation (Allen) methods. These 4 standard samples, with N contents ranging from 0.005-0.028%, are now available as N standards for analysts interested in this determination. Repeated analyses of several standard samples of Fe and steel showed that N content of these samples did not change over periods as long as 13 years. WAT (25)

Atomic Hydrogen Occluded in Iron Nitride. Shun-Ichi Satoh. *Nature*, Vol. 128, Sept. 12, 1932, page 457. Tests corroborated that atomic H, besides being occluded when Fe is quenched from a high temperature or when it is electrolytically deposited, is also present in Fe nitride when Fe is heated in ammonia gas or immersed in a solution of $K_3Fe(CN)_6$. Ha (25)

The Hydrogen Content of Zinc, Especially Electrolytic Zinc. (Untersuchungen über den Wasserstoffgehalt in Zink mit besonderer Berücksichtigung von Elektrolytzink.) P. Röntgen & F. Möller. *Metallwirtschaft*, Vol. 11, Dec. 16, 1932, pages 685-687; Dec. 23, 1932, pages 697-699. Several methods were used for determination of H, hot extraction from molten Zn and combustion with O, solution in H_2SO_4 and determination of total H evolved and calculation of excess over that resulting from solution of Zn, solution in other solvents without H evolution, and amalgamation with Hg. Most of tests were made by first method and could be reproduced within 4%. No difference was found in H content of newly made and old electrolytic Zn. Edges of electrolytic slabs contained more H than center. Zn electrolyzed with colloid additions contained less H than without. Higher bath temperatures and higher current produced higher H absorption. Gas absorbed was almost always pure H. Very little or none of H was in form of $Zn(OH)_2$. Smelted Zn contained less H than electrolytic, and amount increased with degree of recrystallization. None of the methods used gave entire H content. 33 references. CEM (25)

The Penetration of Hydrogen Through Steel at Four Thousand Atmospheres. Thomas C. Poulter & Lester Uffelman. *Physics*, Vol. 3, Sept. 1932, pages 147-148. Study was made of penetration of H through a very fine grained steel as compared to usual grade of steel used in construction of pressure equipment. Penetration was studied in especially constructed cylinders and found to take place at much lower pressure than had been previously recorded. Penetrating effect of H was observed at as low as 4000 atmospheres, whereas 9000 atmospheres is lowest pressure previously recorded for this effect. At a pressure of 4000 atmospheres a rapid evolution of H was observed after 5 min. followed shortly by escape of a small quantity of an oily solution which was used as a means of detecting any penetration. WAT (25)

Reaction of Gases with Incandescent Tantalum. Mary R. Andrews. *Journal American Chemical Society*, Vol. 54, May 1932, pages 1845-1854. A study has been made of the behavior of filaments of Ta when heated in low pressures of N, H, O or hydrocarbons. In N, absorption increases with increased pressure until about 100 volumes are absorbed. At this point the equilibrium pressure drops as absorption increases. Absorption can take place to the formation of TaN. In H, the amount absorbed depends on the concentration of atomic H in the gas. In O, absorption followed by oxide formation occurs. In hydrocarbons, 2 carbides may be formed, both having high melting points. MEH (25)

Sorption of Gases by Copper. Arthur F. Benton & T. A. White. *Journal American Chemical Society*, Vol. 54, Apr. 1932, pages 1373-1390. Sorptions of N, H and CO by 2 samples of reduced Cu have been measured at pressures up to 1 atm. and at temperatures down to 78° K. MEH (25)

The Sorption of Gases by Iron. Arthur F. Benton & T. A. White. *Journal American Chemical Society*, Vol. 54, May 1932, pages 1820-1830. The isothermal sorptions of N, CO and H by reduced Fe have been measured at pressures up to 1 atm. and over a range of temperatures down to 78° K. It is found that in general sorption involves 3 definitely distinguishable processes: (a) adsorption of the physical type, (b) adsorption of the activated type and (c) probably solution. The distinguishing characteristics of each process have been elucidated in respect to rates, equilibria, heats and thickness of adsorbed layers. With all three gases at —183° C. and below, the sorption consists solely of physical adsorption. In each case activated adsorption occurs at higher temperatures. The rate of the process is greatest for CO and least for N. With H at 110° C. and above, the third process, ascribed to solution, comes into prominence. MEH (25)

Adsorption and Solution of Gases by Metals. Arthur F. Benton. *Transactions Faraday Society*, Vol. 28, Apr. 1932, pages 202-218. Includes bibliography. New investigations of the following systems were described and results given in the form of graphs: Cu-N_2; Cu-H_2; Cu-CO; Fe-N_2; Fe-CO; Fe-H_2; Ni-H_2; Ag-O_2. From experiments on both equilibria and rates over a wide range of temperature, and particularly from the effects observed following rapid changes of temperature, definite evidence was obtained in all cases except those involving nitrogen, that 3 different processes occur: physical adsorption, activated adsorption and solution. The contribution of each of these processes to the total sorption was determined. PRK (25)

The Heats of Adsorption of Hydrogen and Carbon Monoxide on Copper. Ralph A. Beebe. *Transactions Faraday Society*, Vol. 28, Oct. 1932, pages 761-765. It was found that the adsorption of the initial portions of CO did not occur uniformly throughout the mass. The adsorption of hydrogen over the whole range and of CO for the later portion of the range, i.e., 4-8 cc., was approximately uniform. The differential molar heats of adsorption varied between 11.5×10^3 and 13.3×10^3 calories for H_2 and between 13.5×10^3 and 15.6×10^3 calories for CO. PRK (25)

Oxygen in Steel. A. Agroskin. *Vestnik Metallopromishlennosti*, (*Metal Industry Herald*), Vol. 12, Feb. 1932, pages 33-38; July 1932, pages 58-66. (In Russian). A survey of the question of O_2 in steel. 30 references. (25)

Adsorption of Gases on Electrolytic Iron Melted in Vacuo. (Ueber Adsorption von Gasen an vakuumgeschmolzenem Electrolyteisen.) F. Durau & C. H. Teckentrup. *Annalen der Physik*, Series 5, Vol. 12, Mar. 1932, pages 927-960. A special Fe powder was prepared from electrolytic Fe, degassed by melting *in vacuo* and pulverized under N_2. Although interior of powder was not gas-free, N_2 could be removed under high vacuum, leaving a gas-free surface. "Chemosorption" was distinguished from pure adsorption by irreversibility of adsorption isotherm, by slow attainment of equilibrium and by difficulty of desorption under high vacuum. On surface pure adsorption occurred for A, H_2, N_2, CO, N_2O, CH_4, C_2H_6, C_3H_8, C_2H_4, C_3H_6 and CH_3Cl; and chemosorption for O_2, CO_2, C_2N_2, HCl, NH_3, NO and SO_2. Even highly adsorbed gases form only a monomolecular layer. Dipole moment in these cases plays no important role. Double bond in a hydrocarbon molecule lessens adsorption. Ha (25)

EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

Thermal Effect in Elastic and Plastic Deformation. M. F. Sayre. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 584-605. Includes discussion. It has long been known that in materials loaded below elastic limit, application of compressive stress causes a rise in temperature and of tensile stress, a decrease, but it has not been generally realized that these temperature changes also involved an elastic after-effect which took form of a gradual creep in length as these temperature differentials become equalized. So-called elastic after-effect and also elastic hysteresis is therefore in part at least due to a purely thermal cause, independent entirely of any defects in elastic behavior in material itself. From viewpoint of creep or hysteresis studies, it is therefore suggested that thermal creep should be estimated and deducted from experimental results before attempting to draw any conclusions as to laws which govern non-thermal component of creep or hysteresis. Numerical estimates of magnitude of thermal creep are given. From viewpoint of accurate stress-strain measurements, as in use of elastic devices for calibration of testing machines, it is suggested that definite time schedules of work be chosen and adhered to in order to minimize effect on accuracy of these 2 types of creep. Above elastic limit, stress variations continue to cause this first type of temperature change, but there is superimposed an increase in temperature resulting from absorption of energy in plastic deformation within material. This energy is concentrated, momentarily at least, in immediate neighborhood of slip planes concerned. Along these slip planes, temperatures therefore rise for a brief fraction of a second to figures probably several thousand times higher than average increase in temperatures which ultimately occurs in entire mass of material. Exact values will be determined in a large measure by speed with which deformation is carried on and by surrounding temperature conditions. It is suggested that unsatisfactory results in past in studies of plastic flow may in part at least have been caused by incomplete control of these speed and temperature factors in testing. VVK (29)

Thermal Expansion of Lead. Peter Hidnert & W. T. Sweeney. *Bureau of Standards Journal of Research*, Vol. 9, Nov. 1932, pages 703-709. Measurements have been made on linear thermal expansion of 3 samples of cast Pb between room temperature and 300° C. and results have been correlated with data obtained by other investigators between 1740 and 1931. A curve has been derived which shows linear thermal expansion of Pb between —253° and +300° C. Summary gives average coefficients of expansion for various temperature ranges between —250° and +300° C. A comparison of indirect results by Kopp and Matthiessen with direct data of other observers, indicates that Pb expands the same in all directions. See also *Metals & Alloys*, Vol. 4, Apr. 1933, MA 95. WAT (29)

Heat Resistant Cast Iron Alloy High in Chromium. (Feuerbeständige Gusseisenlegierung mit hohem Chromgehalt.) *Feuerungstechnik*, Vol. 20, Aug. 15, 1932, page 127. Heat resistant cast Fe, displaying large physical strength at elevated temperatures is sold by the Meier & Weichel Co., Leipzig. Alloy contains 22-26% Cr and 1.8-2.5% C. EF (29)

Heat Resisting Steels. *Iron & Coal Trades Review*, Vol. 124, June 24, 1932, page 1032. A resume of the high temperature research of W. Oertel & A. Schepers. See "Heat Resistant Steel Containing Chromium, Nickel, Aluminum and Silicon," *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 90. Ha (29)

Thermoelectric Power of Single Crystal Bismuth Near the Melting Point. Adolf Soroos. *Physical Review*, Vol. 41, Aug. 1932, pages 516-522. By investigating directly thermoelectric power of Bi single crystals near melting point a transition region is found in which thermoelectric power changes gradually from that characteristic of the solid to that characteristic of final liquid state. Region extends from melting point to about 8° C. above it. As an explanation it is supposed that a definite crystal structure persists into liquid state. WAT (29)

Kanthal, a New Electrical Resistance Alloy. J. H. Russell. *Metallurgia*, Vol. 6, Oct. 1932, pages 195-197. Describes a new alloy suitable for resistance elements in high-temperature furnaces that will stand higher temperatures than Ni-Cr alloys. The exact composition of the alloy is not given, but it is stated to contain Al, Cr and Co. It is made in 3 grades whose maximum working temperatures are 1325, 1250, and 1050° C. It may be used either as cast or after hot rolling. JLG (29)

The Creep of Metals. A. Nadai. *Preprint American Society of Mechanical Engineers*, June 1932, 9 pages. A number of idealized cases of plastic flow of a more or less simple nature are discussed with intention of throwing some light on how speed of yielding influences stresses under which metallic bars are permanently stretched or twisted at normal or elevated temperatures. Treatment is entirely mathematical. WAT (29)

Effect of Carbon and Silicon on the Growth and Scaling of Gray Cast Iron. (Influence du Carbone et du Silicium sur le Gonflement et l'Oxydation de la Fonte Grise.) A. L. Norbury & E. Morgan. *Bulletin de l'Association Technique de Fonderie*, Mar. 1932, pages 96-97. Summarized translation. See *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 27. FR (29)

On the Transformation of Magnetite at a Low Temperature. Tosihiko Okamura. *Science Reports Tohoku Imperial University*, Vol. 21, July 1932, pages 231-241. Allotropic modification of natural magnetite at low temperature was examined by thermal analysis, thermal expansion, electrical resistance and magnetic method. Existence of this allotropic modification in temperature range of —158° to —166° C was confirmed. Apparatus and method of measurements are described; results show there is small change of lattice, but considerable change of electrons in atoms and of orientation of atoms. Ha (29)

Research on Causes of Failures in Steel Plates of Water-tube Boiler Drums. (Recherche des Causes d'Accidents des Toles de Chaudières Aquatubulaires.) G. Paris. *Chaleur et Industrie*, Vol. 13, June 1932, pages 391-395. Failures are not so frequent in plates of water-tube boilers as in boiler or superheater tubes but when they occur they can be dangerous. Differences of quality between drum plate steel and tube steel are studied. Plates can be laminated from ingots not deoxidized by means of Al or ferro-alloys additions and showing pronounced segregation. On the contrary, seamless tubes can only be manufactured from very homogeneous ingots of thoroughly deoxidized metal. Mechanical properties of steel plates are examined; open hearth steel is used and is classified according to tensile strength: (1) from 36-42 kg./mm.^{2}; (2) 40-47 kg./mm.^{2}; (3) 44-52 kg./mm.^{2}; (4) 48-57 kg./mm.^{2}. Only classes 1 and 2 are used for heated parts. Plates must be thoroughly annealed at temperatures ranging from 950° C. for class 1 to 850° C. for class 4. Properties of steel are also controlled by static bending and dynamic transverse tests. After a long service, steel may undergo changes. Breaking strength, elastic limit and elongation are not appreciably modified but shock resistance may be considerably lowered; this fact results from grain growth. Chemical properties are reviewed and a micrographic study is given; plates must be annealed and used at temperatures below 325° C. Grain size which affects shock resistance considerably depends largely upon temperature, reduction during working and duration of treatment. Defective annealing can cause failures as well as recrystallization. FR (29)

An Experimental and Analytic Investigation of Creep in Bending. G. H. MacCullough. *Preprint American Society of Mechanical Engineers*, June 1932, 13 pages. An experimental and analytical study of phenomenon of creep as it occurs in bending is given. Creep tests on a Pb beam were made to determine behavior of originally plane sections during pure bending accompanied by creep. From results of these tests and of creep tests in tension and compression, a method is devised whereby results of usual tensile creep test may be utilized to predict rate of creep for transverse sections of the beam. Several analytical examples involving creep as it occurs in pure bending and in simple torsion are also given. WAT (29)

Correlation of Tension, Creep and Fatigue Tests of 0.17 Per Cent Carbon Steel at Elevated Temperatures. P. G. McVetty. Report of Subcommittee IV of the Joint Research Committee on Effect of Temperature on the Properties of Metals. *American Society for Testing Materials, Preprint* No. 31, June 1932, pages 6-8. Chart compares results of tensile, creep and fatigue tests on a 0.17% C steel made by Kanter & Spring, Moore & Alleman, and Wiberg. Curves indicate that a design based upon allowable deformation within life of material in service will not result in a fatigue failure. This conclusion refers to K 1 (0.17% C) steel and further tests are necessary to establish a law. VVK (29)

The Properties of Metal for High-Temperature—High-Pressure Engineering—Part I. J. H. G. Monypenny. *Iron & Steel Industry & British Foundryman*, Vol. 6, Oct. 1932, pages 9-13. Author indicates briefly response of metals to stress at various temperatures, and significance of their behavior in regard to design. At 550° C. C steels completely soften. This temperature is not materially affected by raising C content, or by moderate alloy additions. Austenitic steels have a higher recrystallization temperature and their usefulness as heat resisting steels is greatly extended. Long exposure to temperature may induce structural changes in steel thus altering their response to stress. Ni-Cr steels, some alloy steels and certain C steels are subject to temper-brittleness if held between 400° and 550° C. for an extended time. Another form of brittleness which seems connected with carbide precipitation is produced in some austenitic steels of Cr-Ni type. Resistance to oxidation is related to Cr content. Additions of Si, Al, or large amounts of Ni add further resistance. Calorizing is very effective in increasing the resistance of Fe alloys to oxidation. CHL (29)

The Creep of Lead and Lead Alloys Used for Cable Sheathing. H. F. Moore & N. J. Alleman. *Bulletin 243, Engineering Experiment Station, University of Illinois*, Feb. 12, 1932, 28 pages. Describes an investigation of "creep" under load of Pb and some of its alloys used in construction of cable sheathing. Specimens of pure Pb and of Pb alloyed with Sb, with Sn, and with Ca were studied. Creep tests were made on tension specimens loaded by dead weights and fitted with special extensometers sensitive to 0.0001". Some continuing creep under steady load was observed for all metals tested, even for stresses as low as 150 lbs./in.^{2}, although an ordinary tension test of metals showed tensile strengths varying from 1530 to 3850 lbs./in.^{2}. Although no absolute creep limit was found an arbitrary method of determining a practical creep limit is suggested and is used. No marked differences in value of this practical creep limit was observed for pure Pb, Sb-Pb alloy, and Sn-Pb alloy. There was some indication of a higher practical creep limit for a Ca-Pb alloy, although data are too few to make this conclusion positive. While there was no marked change of practical creep limit observed under range of temperature studied (32°-150° F), there was a distinct acceleration of creep for higher stresses with increase of temperature. A few tests which have been in progress for more than 5000 hrs. have so far given no ground for changing conclusions drawn from 1000-hr. tests. Definite creep was observed in tests of full-sized specimens of sheathing under internal oil pressure giving circumferential stresses of about 200 lbs./in.^{2}. Average rate of creep seemed to be somewhat less for these full-sized specimens than for tension specimens of similar material. HFM (29)

Behavior of Materials During Cooling Down to Extremely Low Temperatures. (Das Verhalten der Stoffe bei der Abkühlung bis zu tiefsten Temperaturen.) W. Meissner. *Zeitschrift für die gesamte Kälteindustrie*, Vol. 39, June 1932, pages 104-111. Paper before Deutscher Kälteverein Lübeck, May 1932, first treats behavior of He and H at low temperatures and next discusses properties of solid material. Single crystals of Cd preserve plasticity even at lowest temperatures. Deformation starts at about the same shearing stress as at room temperatures. But when gliding begins, shearing stress increases rapidly (up to 800 times shearing stress prevailing at the beginning of deformation). Tensile strength of amorphous bodies at lowest temperatures is slightly higher than at ordinary temperatures. Practically no plastic deformation takes place. After a certain degree of deformation, polycrystalline materials show a behavior similar to amorphous ones. After a certain deformation fracture occurs. Author experimentally determined following yield pressures in 10^3 kg./cm.^{2} at ° abs.:

	293°	77°	20°
Au	1.3	2.0	2.7
Cu	2.0	?	4.0
Pb	0.28	0.62	1.76
Sn	0.45	2.3	5.5
Pt	3.0	11.4	25.7

Diagram shows 5 different physical properties of an annealed steel between —200° and +600° C. Except for impact hardness, physical properties at lower temperatures are better. There is no danger if steel is not stressed above elastic limit. Same holds for Duralumin and Cu. Next atomic heat at falling temperatures is dealt with. This drops much like specific heat expansion. The thermo-electric force approaches 0 towards the absolute 0° point. Some alloys (manganin, constantan) can be used for thermo-couples. Behavior of para- and ferro-magnetic material is reviewed. Thermal conductivity of Cu increases 20 times between 0° and —250° C. Proportionality between abs. temperature and electric conductivity does not exist at low temperatures. Wiedemann-Franz-Lorenz law for metals and alloys does not hold true at low temperatures according to author's results. The latest experiments on supra-conductivity are summarized. The writer discovered additional resistances in Pb are due to contaminations and internal stresses (+ 1° abs.). The break points of binary (In-Pb, In-Tl, Mo-C) alloys are graphically presented. Based on his experiments, author sets forth an interpretation of the supra-conductivity phenomenon and concludes with the temperature measuring technique at extremely low temperatures. EF (29)

The Atomic Heat of Bismuth at High Temperatures. L. G. Carpenter & T. F. Harle. *Proceedings Royal Society*, Vol. 136A, May 1932, pages 243-250. The thermal capacity of metallic Bi as reported by a number of investigators is reviewed in graphical form. Though the true specific heat from absolute zero up to air temperatures is known from published measurements, values from air temperatures up to the melting point have only been determined on a mean average. Values of the true specific heat of the liquid and its variations with temperature are not definitely enough known. In order to use a vacuum calorimeter at temperatures much above room temperature it is necessary to evolve a design employing materials which have satisfactory electrical, mechanical and thermal properties at the temperatures in question. Such a calorimeter has been successfully developed, and the paper describes its construction and gives results made by means of it on Bi, over a temperature range of 30°-370° C. WAT (29)

With ever increasing temperatures and pressures==what?

These abstracts are prepared in cooperation with the Joint High Temperature Committee of the A. S. M. E. and the A. S. T. M.

The Creep of Materials and Creep Stresses. V. Jas. Cunningham. *Steam Engineer*, Vol. 2, Nov. 1932, pages 86-87. General. AHE (29)

Creep of Steel at Elevated Temperatures. (Die Kriechgefahr des Stahles bei erhöhten Temperaturen.) H. Holdt. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 50-54. Paper presented at Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. Discussion of creep in general and of tests performed according to Pomp method. Our present knowledge shows that highly alloyed steels may have a lower creep limit than straight C steels, even alloy steels that gave favorable results in hot tensile tests failed in creep tests. Tests of author seem to indicate that structure is of prime importance for creep properties. Unannealed cast steel with coarse Widmannstätten structure, for instance, gave a creep limit of 14.5 kg./mm.^{2} at 400° C.; when annealed with net structure the creep limit was 10.8 kg./mm.^{2} and when carefully annealed in a laboratory furnace, showed pearlite and ferrite finely distributed, only 9.9 kg./mm.^{2}. Structure of cementite is also of importance; lamellar pearlite gives a higher creep limit than globular cementite, coarser grain frequently gives better values than finer. Effect of Cr, Mo and W on creep properties is discussed. Recent tests show that highly stressed areas of constructions such as notches, transitions of cross-sections and bores, creep less due to reinforcement of neighboring less strained areas. Behavior of steels under simultaneous creep and alternating fatigue loads is discussed. Indications are that superimposed alternating loads are of minor importance for creep. GN (29)

Shearing Stresses in Torsion and Bending by Membrane Analogy. P. Allerton Cushman. *Preprint American Society of Mechanical Engineers*, June 1932, 6 pages. A mathematical solution for shearing stresses in bars subjected to torsion and bending is given. Method of Saint Venant for observing amount of torsion and bending is applied. Equipment used is described in detail. In case of torsion, one simple problem is given in order to describe method of establishing degree of precision of soap film procedure. Problem of twist of angles having various fillet radii is developed. In case of bending, circular, rectangular and I-beam sections are chosen for soap film analysis. Circular and rectangular results are in good agreement with Saint Venant theory. I-beam results show stresses of same character as indicated by elementary theory. WAT (29)

Heat-Resisting Cast Iron for Boiler Furnaces. J. S. Gander. *Engineering & Boiler House Review*, Vol. 46, Oct. 1932, pages 226, 228, 230. Metallurgical changes, growth and scaling, of ordinary cast Fe under heat are explained. Addition of Ni or Ni-Cr improves material, a very low Si content is possible so that machinability is increased. Methods of handling added metals in melting processes are described briefly and a few micrographs illustrate structural characteristics. Ha (29)

Effect of Temperature on the Properties of Metals. Report of the Joint Research Committee on Effect of Temperature on the Properties of Metals, H. J. French, Chairman, *American Society for Testing Materials, Preprint* No. 31, June 1932, 22 pages. Organization, contributors, coöperative researches and bibliographic work of the committee are given. The reports of the subcommittees are abstracted individually. VVK (29)

Heat-resistant Metallic Materials. (Hitzebeständige metallische Werkstoffe.) G. Garre. *Der Werksleiter*, Vol. 6, Aug. 10, 1932, pages 182-185. Paper gives survey on present status in this field and deals with (1) Fe base alloys, and Cr-Ni base, noble metals, (2) processing of heat resistant surfaces by calorizing, sherardizing, etc. with special reference to surface protection by Cr, W, Mo, Si. GN (29)

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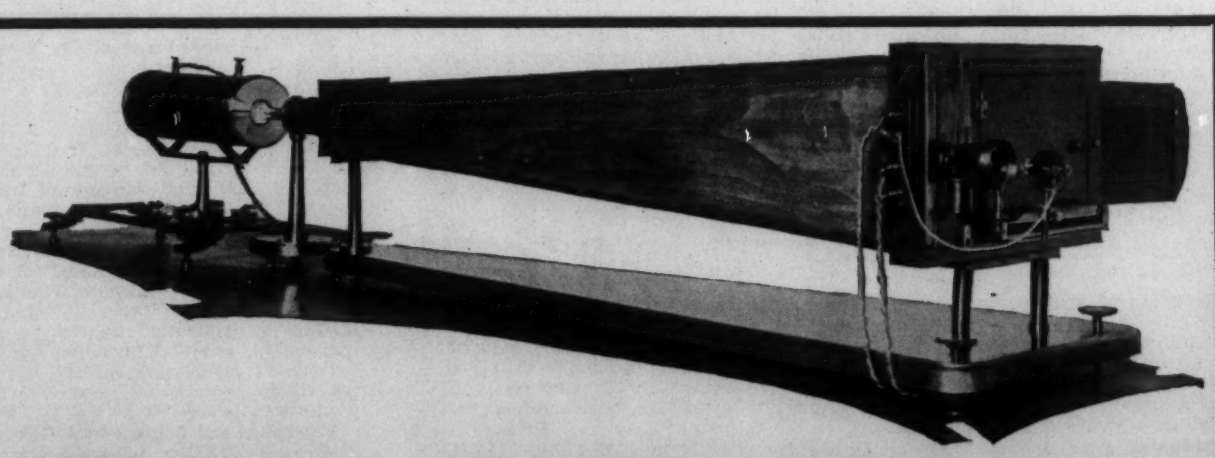

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Change of Properties of Hematite Pig Iron. (Aenderung der Eigenschaften des in erster Schmelzung vergossenen Hämatitroheisens.) E. PIWOWARSKY. *Mitteilungen aus dem Giesserei-Institut der technischen Hochschule Aachen,* Vol. 2, Oct. 1931, 2 pages. See *Metals & Alloys,* Vol. 1, Nov. 1930, page 857. (31)

New Installations for Dust Agglomeration in the Plants of Arbed in Dudelingen and Terres Rouges in Belval. (Nouvelles Installations d'Agglomeration de Poussieres aux Usines des Arbed a Dudelange et des Terres Rouges a Belval.) JOSEPH PAQUET. *Revue Technique Luxembourgeoise,* Vol. 24, Jan.-Feb. 1932, pages 1-5. Two installations for collecting and sintering blast furnace dust are described and the composition of the dusts is given. Ha (31)

Electrometallurgy of Copper and Cobalt in Belgian Congo. (La metallurgie electrique du cuivre et du cobalt au Congo Belge.) R. SEVIN. *Journal du Four Electrique,* Vol. 41, Feb. 1932, pages 50-54. Ores averaging 7.5% Cu are crushed. The concentrates from hand picking go to 4 water jacketed furnaces with 50-75 tons/day capacity. The rest of the ore is tabled, producing concentrates with 28-30% Cu, which are floated to give concentrates averaging 33.50% Cu and tailings containing 1.2-1.7% Cu in the Chituru plant the ores are lixiviated by H_2SO_4 in counter-current flow at the rate of 1600-1800 tons/day. To increase current efficiency before electrolytic separation of Cu the solution is neutralized by ore addition until most of the Fe and Al are hydrolized. They are removed; the electrolyte containing about 5 g./l. of Fe permits an efficiency of 85%. H_2SO_4 is made at a neighboring plant from imported S. Co ores containing more than 6% Co are melted at Katanga in electric furnaces under reducing conditions. The complex Cu-Co-Fe-Mn-Si-C alloy liquates strongly producing a white layer rich in Co and Fe and a red layer containing most of the Cu with 3 to 5% of Co and Fe. The white layer contains 14-17% Cu and 35-45% of both Co and Fe. Co ores very rich in Cu are melted in water jacketed furnaces so as to reduce most of the Cu without reducing Fe or Co. The slag of the process contains 5-6% Co and about 5-7% Cu. Cu produced averages 98-99% pure. With high Cu ores containing 1-4% Co strongly reducing waterjacket smelting is used so as to produce Cu containing all the Co present. Its ingots are shipped to Oolen in Belgium where the Cu is leached out with 66° Be H_2SO_4 and the sponge is sintered for Co. Detailed description of the equipment and processes is given. JDG (31)

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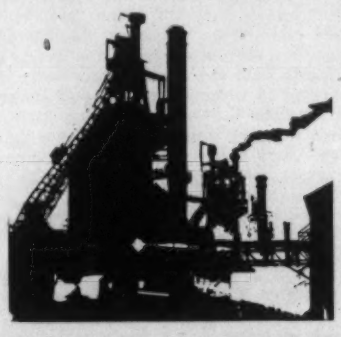

Properties of Iron Made by Hydrogen Reduction. HEIHACHI KAMURA. *Iron & Steel Industry & British Foundryman,* Vol. 6, Oct. 1932, pages 15-18. Reprint of paper presented before American Electrochemical Society, Sept. 1932. 10 Fe ores and 2 mill scales were reduced with H_2 in cylindrical Fe retorts. Depending on density of ore, reduction was complete at from 500° to 1100° C. The sponge Fe after melting and casting is simular to Swedish charcoal and Armco Fe in properties and composition. Fe oxide reduced more easily than P_2O_5. CHL (31)

Ores Reduced to Steels in Hollow-Electrode Furnaces. T. HOLLAND NELSON. *Iron Age,* Vol. 129, May 12, 1932, pages 1066-1068. Describes operation of Wiles hollow-electrode furnace for passing finely divided ores mixed with reducing materials through hollow-electrodes. Analysis of heats for low C-Cr, medium C-high Cr and low C-Cr-Ni steels are given. There is no necessity to use deoxidizers to kill the steel. Material for introduction into hollow electrode must be intimately mixed. Any metalliferous oxides may be reduced by passing them through retort and obtaining a bath of molten metal, removing accumulated slag and proceeding according to ordinary furnace practice. VSP (31)

The Results of the All-Union Conference for Making Iron Directly from Ores. A. N. POKHVISTNEV & S. O. HITRICK. *Domez,* No. 4-5, 1932, pages 1-19. (In Russian.) Technical literature on direct production of Fe from ore is reviewed. Bochum plant of Krupp's is described and data on operating practice are given. (31)

Zinc Extraction Works Practice. *Metal Industry,* London, Vol. 41, Aug. 19, 1932, pages 171-173. The methods of extracting, distilling and refining Zn as practiced in England are described. Particular stress is laid on elimination of losses by fume condensation and in general recovery of Zn in roasting. Furnaces, retorts used for distillation, and methods used are described. Ha (31)

The Causes of Formation of Zinc Dust. (Les Causes de Formation de la Poussière de Zinc.) R. BROSIUS. *Revue Universelle des Mines,* Series 8, Vol. 8, Dec. 1, 1932, pages 317-324. When reducing Zn ores with C, between 8 and 15% of Zn in mineral condenses as fine dust, largely ZnO formed by reaction $CO_2 + Zn = ZnO + CO$ or by unavoidable entry of air to the furnace and condenser. This formation takes place particularly during last hours of reduction where temperature is so high that Zn volatilizes and is carried away with gas flow. Content of N in reduction agent, dilution of Zn vapors and surface tension of latter contribute also to dust formation. Melting furnaces for melting dust to Zn metal are described which yield more than 90% metal. 8 references. Ha (31)

Forms of Copper Found in Reverberatory Slags. ROYAL B. JACKMAN & CARLE R. HAYWARD. *American Institute Mining & Metallurgical Engineers, Contribution* No. 6, Feb. 1933, 9 pages. Chemical analyses, microscopic examination and X-ray diffraction patterns of reverberatory slag indicated that practically all of the Cu occurs as sulphide particles having a structure similar to bornite. The particles probably result from dust settling on the slag. Methods for recovering Cu from slag by flotation or leaching were developed. 11 references. JLG (31)

Reduction of Magnesia by Silicon. (Sur la réduction de la magnésie par le silicium.) G. GIRE. *Comptes Rendus,* Vol. 194, Mar. 7, 1932, pages 884-886. Possibility of reversing reaction $2\ Mg + SiO_2 = 2\ MgO + Si$ and obtaining Mg from its oxide is shown from a discussion of thermal quantities involved and comparison with a known reaction stated to be similar to one in question. This gives a temperature of about 1300° C. for reversal of reaction, which was verified experimentally. No Mg silicide formed. OWE (31)

Reduction of Palladium Oxide by Carbon Monoxide. PAUL V. MCKINNEY. *Journal American Chemical Society,* Vol. 54, Dec. 1932, pages 4498-4504. A slight initial reduction of Pd oxide by CO has been observed at 23°. If adsorbed O is removed the reduction does not occur below 76°. Samples of the oxide have been reduced at 100, 110, 124, 138 and 156°. Below 156° the reduction does not proceed to completion but decreases in rate with time. The influence of CO_2 and O on the reduction is discussed. MEH (31)

Coke Consumption Per Ton in a Plant Furnace. (La mise au mille de coke au haut-fourneau.) J. VALLET. *Revue de Metallurgie,* Vol. 29, May 1932, pages 238-240. In a former paper (The Value of Iron Ore or Additions to a Blast Furnace as a Function of Iron Yield, *Metals & Alloys,* Vol. 1, Nov. 1930, page 857.) formulas were given for calculation of the influence on the furnace yield of different operating variables. In the present article additional formulas are given permitting the discounting of interfering influences when it becomes necessary to compare the performance of the furnaces after given changes in operating practice. JDG (31)

Dnieper Aluminum Combine. V. S. TATARYISKY. *Light Metals,* Feb. 1932, pages 12-27. (In Russian.) The largest Al works in Russia is expected to produce 15,000 tons of Al yearly. Bauxites with 13-18% SiO_2 are fused in an electric furnace with $BaCO_3$ and Fe turnings. Ferro-silicon is produced, is separated by gravity and the slag is leached with water. $BaAl_2O_4$ is dissolved; $Al(OH)_3$ is precipitated from the solution with CO_2. One ton of calcined Al_2O_3 requires 4 tons of slag and 6000 kw.hr. Miguet furnaces with a capacity of 10,000 kw.hr. and using continuous electrodes are employed for melting. Mechanical equipment and general arrangement of the plant are given for the Al_2O_3 production plant, the electrode works and the electrolytic installation. (31)

Development of Blast Furnace Operation in Oberschlesien since 1913. (Entwicklung des Hochofenbetriebes in Oberschlesien seit deim Jahre 1913.) RICHARD KREIDE. *Stahl und Eisen,* Vol. 52, Apr. 14, 1932, pages 365-367. The Oberschlesien plant is described, including 2 briquetting works, each with a press capacity 120 to 140 tons/24 hrs.; 1 Giesecke sintering plant with 1 furnace producing 3000 to 4000 tons/mo.; 1 Heberlein sintering plant producing 1200 tons/mo.; and 2 Dwight-Lloyd roasters producing 12,000 to 14,000 tons/mo. Improvements in quality of coke, blast furnace construction and operation since 1913 have increased furnace production from 108 to 302 tons/24 hrs., decreased coke from 1100 to 1000 kg./ton pig Fe, increased blast temperature from 550° to 720° C. and blast pressure from 23 to 57.5 cm. Hg. and also decreased the amount of slag and the furnace period. DTR (31)

Some Features of Lead Blast-Furnace Operations at the Works of the Broken Hill Associated Smelters Proprietary, Limited, Port Pirie, South Australia. O. H. WOODWARD. *Bulletin Institution of Mining & Metallurgy,* No. 329, Feb. 1932, pages 53-56; *Proceedings Australasian Institute of Mining & Metallurgy,* No. 85, Mar. 31, 1932, pages 1-5. Discussion. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 84. AHE (31)

Production of Sponge Iron in Germany. (Die Eisenschwamm-Erzeugung in Deutschland.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Feb. 28, 1932, pages 114-116. The present status of the production of sponge Fe in Germany is outlined and the new plant of the "Eisenschwamm G.m.b.H." at Bochum, Germany, is described. The plant operates on a modified Edwin method. The ores are reduced in muffles about 2½ m. wide and 1½ m. high containing about 3 tons of ore. The bottoms of the muffles are perforated so that the reduction gases can enter the muffles which are placed on top of each other and passed through 3 furnaces,—first, preheating (ore roasting), second, reducing and last cooling. The reduction gas analyzes about 60% Co and 40% H. The CO_2 originating is regenerated by passing it over coke in an electric arc furnace at about 1800° C. The H consumed is replaced by coke oven gas, containing about 50% H and 25% CH_4. The CH_4 decomposes to H. It has been found necessary to classify and concentrate the raw ore before reducing it. GN (31)

Roasting Iron Ore by the Folisain Method. (Sinterung von Eisenerz nach dem Folisain-Verfahren.) *Stahl und Eisen,* Vol. 52, Apr. 7, 1932, page 345. The article in *La Métallurgie,* 1931, No. 1, pages 11-15, is summarized. Experimental roasting of an ore-fuel mixture is made in an ordinary rotary-tube furnace under action of preheated air blast at 650°-800° C. Although temperatures reach 2200° C. it is claimed that the sinter remains spongy without melting, permeable to gases and resistant to compression. Due to the peculiarity of the gaseous atmosphere, Fe goes over into the favorable ferrous condition and undesirable impurities,—S, As, Pb and Zn, are completely removed. Maximum furnace production is 300 tons/24 hrs. Per ton of product the working time is 28 min., and 300,000 Kcal. of fuel, 0.1 m.³ of H_2O and 6 kw.hr. of power are used. DTR (31)

Simplify Weekly Shutdowns by Slow Driving of Stacks. *Steel,* Vol. 90, Jan. 4, 1932, pages 156, 163. The slow driving of blast-furnace stacks over week ends when hot metal is not needed is an economical practice with furnaces up to 30,000 ft.³ capacity. Fine grinding, magnetic concentration, and sintering have made cheaper magnetic ores available. The washing of coking coals has reduced costs and improved the quality of Fe and steel. The trend in the industry has been toward decreased costs and increased regularity of operation. JN (31)

The Newcastle Blast Furnace. *South African Mining & Engineering Journal,* Vol. 42, Part 2, Sept. 26, 1931, pages 93-94. Descriptive. AHE (31)

The Correlation of Blast Furnace Data. E. C. EVANS, L. REEVE & M. A. VERNON. *Rolling Mill Journal,* Vol. 5, May 1931, pages 327-330. Abstract of a report presented before the British Institute of Metals, May 7, 1931. See *Metals & Alloys,* Vol. 3, Apr. 1932, page MA 113. A critical examination in the light of more recent data of the empirical equation developed by Evans and Bailey for the correlation of the factors involved in blast furnace operation. JN (31)

The Modern Blast Furnace. GEO. E. BUTLER. *Foundry Trade Journal,* Vol. 46, Mar. 3, 1932, page 145; Mar. 17, 1932, pages 177-179; *Iron & Coal Trades Review,* Vol. 124, Feb. 19, 1932; page 321; Feb. 26, 1932, pages 364-366. Paper read before the Cleveland Institution of Engineers, dealing with developments of blast-furnace lines in America and of large-output furnaces in Europe. Special attention is given to the fitting of hot jackets, to the relationship between furnace columns and tuyère positions, and to improvements in shaft-belt construction and shaft-cooling plates. Reference is made to new refractories that have found a place in blast-furnace construction, and brief notice is taken of blast-furnace operation. The paper closes with a description of the British blast-furnace and its possible output. OWE + Ha (31)

The Anode Department of the Noranda Smelter. W. B. BOGGS, J. N. ANDERSON & R. J. WESTWOOD. *Canadian Mining & Metallurgical Bulletin* No. 240, Apr. 1932, pages 127-161. The procedure in refining the Cu and casting the anodes and the furnaces and equipment used are described in detail. A typical anode analyzes Cu 99.5000%, O 0.0940%, Pb trace, As 0.0004%, Sb trace, Bi 0.0003%, Se 0.2380%, Te 0.0520%, Fe 0.0160%, Ni 0.0204%, S 0.0030%, Ag 0.0456% and Au 0.0290%. O is estimated by comparison of polished and etched samples with standards of known O content, photomicrographs of which are shown. The first successful application of a basic monolithic bottom to a Cu refining furnace is described. AHE (31)

Effect of Carbon on Dissolved Heavy Metals, especially on Platinic Chloride. (Ueber die Einwirkung von Kohle auf gelöste Schwermetalle, Insbesondere auf Platinchlorid.) E. HEYMANN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 207, Aug. 24, 1932, pages 251-256. Chemical and X-ray examinations prove that, in treating solutions of platinic chloride with C at room temperature, a hydrolytic adsorption of a Pt oxide first occurs. The reduction to metallic Pt takes place only at 100° C.; this is contrary to action with Au, Ag and Hg salts which are reduced to metals by purified adsorption C at room temperatures. Ha (31)

Germanium and Gallium from Germanite. (Germanium und Gallium aus Germanit.) R. BERG & W. KEIL. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Dec. 1932, pages 383-384. Treatment of African germanite to yield Ga and Ge is described. It is based on easy solubility of gallium chloride in ether. 4 references. Ha (31)

Nickel Steel Direct from the Ore. *Engineer,* Vol. 153, Apr. 22, 1932, page 457. See "Semi-Direct Production of Nickel Steel from Sudbury Ore," *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 91. LFM (31)

NON-METALLIC COATINGS FOR METALS & ALLOYS (32)

Metal Powder Paint. (Metallpulverfarbe.) *Farbe und Lack*, Sept. 14, 1932, page 464. The metal powder (Al, bronze, Au, Ag, etc.) is treated with a volatile liquid (white spirit, turpentine, amyl alcohol) before preparing the aqueous dispersion in a bituminous substance (asphalt) to which glue is added as stabilizer. EF (32)

Dry Process Enamels for Signs. L. STUCKERT. *Ceramic Age*, Vol. 20, Oct. 1932, pages 140-142, 160-162. Properties of enamels to be used for sheet steel, cast Fe and other metals and method of their application is described. Recipes for colored, transparent, majolica, matt, acid resisting and other enamels are given. Ha (32)

Researches on the Anodic Film of Aluminum. I. Effect of Concentration of the Electrolyte on the Formation of the Anodic Film. SH. SETOH & A. MIYATA. *Scientific Papers Institute of Physical & Chemical Research*, Tokyo, Vol. 19, Sept. 17, 1932, pages 189-236. The film formation is not necessarily influenced by the conductivity alone, which becomes higher with increase of concentration and temperature of the solution. From the experimental results of weight increase, thickness of film and apparent density, it is reasonable to assume that Al_2O_3 forms. A quarter of the film always dissolves irrespective of the concentration. High current density in concentrated solutions is apt to decompose the oxalic acid. In a.c. electrolysis the effects of film dissolving and of decomposition of oxalic acid are more conspicuous. Energy efficiency of the film formation in a.c. is inferior to d.c. electrolysis. The film thickness is nearly proportional to the quantity of electricity and amounts to 26.4μ amps.-min./unit electrode area. Apparent film density is about 3.0 in every case. The electrical resistance in the visible film formed at low current densities or voltages in concentrated solutions is high. These films exhibit a strong resistance against corrosion. The same holds true for films formed (a) in hot solutions and (b) with simultaneous superposition of d.c. and a.c. Superposition of a.c. has no effect on the current efficiency of film formation irrespective of concentration. 2-6% is a suitable electrolyte concentration for the film formation. Changes of the electrolyte brought on by the reaction due to the current are generally independent of the concentration except in extremely dilute or concentrated solutions. This is closely connected with the life time of the electrolyte in practical operation. Decomposition of the oxalic acid at the electrodes has only a minor effect and the Al content of the solution plays an important role. The decomposition of oxalic acid is about 0.132 g./amps.hr irrespective of the solution concentration. WH (32)

Contributions on the Explanation of the Sticking of Enamels on Iron Sheet. (Beiträge zur Erklärung des Haftens von Emaille an Eisenblech.) K. MEURES & E. ZSCHIMMER. *Sprechsaal für Keramik, Glas, Email*, Vol. 65, Jan. 28, 1932, pages 63-64; Feb. 4, 1932, pages 83-85; Feb. 11, 1932, pages 98-100; Feb. 18, 1932, pages 119-121; Feb. 25, 1932, pages 138-139. In this comprehensive investigation a raw enamel of the composition: SiO_2: 55.16%, B_2O_3: 14.46%, TiO_2: .22%, Al_2O_3: 5.89%, Fe_2O_3: .22%, Na_2O: 13.76%, K_2O: 5.80%, MgO: .01%, CaO: 4.48% and containing no sticking oxides was used for enameling in laboratory tests Fe sheets containing C: 0.0%, Si: .01%, Mn: .38%, P: .14%, S: .058%. The procedure used is described in detail, the grain sizes of the enamel are stated. After enameling the sheets were quenched from 200° C. The principal results are: (1) The enamel was still sticking tightly after 3½ years but separated from the sheets in bending tests. The behavior of enamels containing sticking oxides and those free from such oxides with the same bending load was compared. (2) Successive layers of the enamel were worn off by sand blasting. The amounts of enamel thus obtained from the 4 layers in equal times show that the hardness decreases rapidly from the surface. This is explained by surface hardening due to quenching. (3) The analysis of the layers shows that surprisingly large amounts of Fe-oxides migrated from the sheet surface in the lowest enamel layer where 9.5% FeO + Fe_2O_3 were found. (4) This goes to show that enameling is not a purely physical but also a chemical process. (5) The loss of Na_2O and K_2O was small, B_2O_3, Al_2O_3 and CaO did not change noticeably. (6) The FeO content in relation to Fe_2O_3 first increases from sheet surface to enamel surface, but decreases near the enamel surface evidently due to surface oxidation. (7) In the improvement of sticking by addition of so-called sticking oxides (CoO) the heat absorption of the enamel probably plays a role in that it affects the temperature and therewith the viscosity of the lowest layer during cooling. 32 references. GN (32)

Automatic Methods for Applying Finish. J. A. PAASCHE. *American Machinist*, Vol. 76, May 19, 1932, pages 645-647. Round, flat or irregularly shaped metal parts are finished by spraying on colors automatically. The equipment is described. Ha (32)

Enameling Furnaces and Its Efficiency. (Brennöfen der Emaillierindustrie und ihre Wirkungsgrade.) W. VÖLKEL. *Industriegas*, No. 4, 1931, pages 86-92; *Sprechsaal für Keramik, Glas, Email*, Vol. 65, Apr. 14, 1932, pages 277-278. Heat balances of 3 types of furnaces are compared. Electrically heated furnaces show a theoretical thermal efficiency of about 25%, gas heated muffle furnaces of about 14%, half-gas muffle furnaces of about 6-8%. A continuously working gas furnace showed 28.35% which can be increased to 52.75% by utilization of the flue gases. GN (32)

Protection of Edges When Testing Anti-Rust Paints. (Über den Kantenschutz bei der Prüfung von Rostschutzfarben.) PETERS. *Korrosion und Metallschutz*, Vol. 8, May 1932, page 140. Note on a paper before the Reichsausschuss für Metallschutz, April 1932. The different behavior between painted, plain areas and edges is stressed, the latter representing regions of least protection. A special protection of edges and corners is urged. EF (32)

On the Influence of Dyeing of Anti-foulings on the Growth of Maritime Organisms. (Über den Einfluss der Färbung von Antifoulings auf den Anwuchs.) M. RAGG. *Farben Zeitung*, Vol. 37, Apr. 23, 1932, pages 1052-1053. Ragg critically discusses a "pessimistic" lecture of Neu before the Gesellschaft der Freunde und Förderer der Hamburgischen Schiffsbau Versuchsanstalt. Based on "tests during several decades," the writer affirms the existence of effective poisonous antifoulings on Hg (against animal and vegetable organisms) and on Cu (against vegetable and infusorial settlements) base. The usefulness of a paint coating with a hard, glass-like surface is decidedly denied, and the use of reflected light rays is also rejected. Marine growth on the ship hull is reduced when bright colors are applied. A different effect between green and blue bottom paints is doubted. Poisonous paints are the only effective antifouling coating at the present time. EF (32)

Regarding the Ability of Paint to Cover Edges, and Its Consideration in the Testing of Paints. (Ueber die Kantendeckfähigkeit und ihre Berücksichtigung bei der Prüfung von Anstrichmitteln.) FRITZ-JÜRGEN PETERS. *Korrosion und Metallschutz*, Vol. 8, July 1932, pages 172-179. In the past the criterion of good paint has been a fluidity such that an evenly thick layer is formed when painted upon flat glass plates. The author points out that such paints run too freely and that edges are likely to have much thinner or no films on them. The best paints are those which do not run and which coat the edges with thicknesses equal to those on flat surfaces. In preparing test pieces paints should be chosen which do not creep around edges. For short tests in which thin films are to be considered the paints will run. Corrosion starting at the edges where the films are thinnest may progress to the centers of the pieces and lead to erroneous conclusions. For cold testing it is suggested that the edges be dipped in a mixture of 2 parts paraffin and 1 of ceresin to a depth of about ½-1 cm. This mixture may also be used to coat weak spots in the films. Where the plates are subjected to hot testing the edges should be given several coats of paint. Even results following the preparations described are occasionally inconclusive. BER (32)

Practical Problems of Corrosion. Part VI. Some Outdoor Tests of Protective Painting. Preliminary Report. U. R. EVANS & S. C. BRITTON. *Journal Society of Chemical Industry*, Vol. 49, Apr. 4, 1932, pages 173T-180T. Several series of paint tests to determine effect of kind of base metal (electrolytic Fe, wrought Fe, steel and Cu-steel), surface finish and type of paint (nitrocellulose lacquers, oxidizing and inhibitive paints) were started in 1929 and 1930. Another series to study influence of mill-scale, rust, condensed moisture and salt below paint coat (alone or in combination), has also been started at 5 different stations representing marine, urban, country, mixed and sulphurous atmospheres; at each station were exposed 128 specimens representing 16 different surface conditions covered with 8 different paints. In these latter tests it is already possible to state that rust, moisture, and salt below the coat are apt to produce rapid failure, although different paints are affected to different extents; damp rust is more dangerous than dry rust, but drying by artificial heat is not, in general, advisable. Effect of scale in early stages is to reduce total corrosion by retarding "frontal attack," but some types of scale aid local attack of the undermining type; different scales behave differently and on this point further information will be available when tests have proceeded further. Results from first tests have shown that small differences in composition of paint have much more influence on the danger of rusting than differences in the character of metal. Practice of bestowing care on analysis of metal and leaving mixing of paint in unscientific hands is illogical and wasteful. Small differences in amount of thinner affect the protective qualities, and sometimes changes which improve appearance of coat decrease its utility. Paints which give good protection under one set of climatic conditions may be comparatively useless under another. VVK (32)

The Practical Problems of Corrosion. Part VII. Some Tests on Protective Painting. Interim Report. S. C. BRITTON & U. R. EVANS. *Journal Society of Chemical Industry*, Vol. 51, July 8, 1932, pages 211T-218T. Progress report on test described in *Journal Society of Chemical Industry*, Vol. 49, Apr. 4, 1930, pages 173T-180T. Summary of fresh information obtained from inspections in the period 1930-1932. Wrought Fe and Cu steel, properly painted, appear to give better service than ordinary steel, owing to more adherent character of the rust (as previously found by other workers). Electrolytic Fe develops rust more slowly than steel at first, but after 2½ years there is little to choose. A single coat of red Pb, in Cambridge (England) atmosphere, gives almost complete protection to good steel, for a period long enough to produce perforation of specimen (0.32 mm. thick) where it is unpainted. Salt, moisture, or old rust shut in below a paint coat cause it to fail prematurely. Mill-scale varies greatly with its behavior. A typical scale may seem to help an unsatisfactory paint to protect it from frontal attack but below a good paint (which by itself should prevent frontal attack) scale aids the undermining type of attack, and is particularly unfavorable in its effect when the time for repainting arrives. A scale broken locally is far more objectionable than a complete scale, and in such cases rapid peeling of paint and scale together often occurs. Removal of scale by pickling is being examined; exposure of "faultily pickled" specimens has up to date given no support for criticisms sometimes made against pickling. Metallic Zn paints can give some protection even at an uncoated gap in coat under atmospheric exposure, whilst red Pb gives some protection at a scratch-line under immersed conditions. Amount of oil and thinner does not greatly affect the value of red Pb paints, provided that paint is not so thin as to produce "clear channels"; Fe oxide paints become steadily less protective as they become thinner. Effective life of paint decreases with drier content if it is applied in dry weather, but increases with drier content if painting is done in wet weather. A series of steel specimens carrying sprayed coats of metallic Al has been started at 4 stations representing urban, marine, country and mixed atmospheres, and up to date results are encouraging. VVK (32)

Nitrocellulose Lacquering of Metal Wares. (Nitrocellulose-Lackierung auf Luxusmetallwaren.) WILHELM FRIEDRICH. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 13, 1932, pages 457-458. Paper first gives an account of the properties of nitrocellulose lacquers, the methods of lacquering, and subsequent treatment. Ornaments are made either according to the cutting method (the parts are first completely lacquered and the ornaments are then cut out) or the pattern method (the spaces of the ornaments are omitted on the lacquer by patterns.) Both of the methods are described in detail. Failures in lacquering are discussed. GN (32)

Painting Aluminum. JUNIUS D. EDWARDS & ROBERT I. WRAY. *Industrial & Engineering Chemistry*, Vol. 25, Jan. 1933, pages 23-26. Painting of Al and its alloys presents much the same problems as are involved in the painting of other metals. Surface preparation is an important factor, however, where protection against water and severely corrosive conditions is demanded. This is not a problem of roughening the surface but of rendering it passive. Anodic coatings of certain types are effective in this respect, and good results are also secured with certain types of chemical cleaners. Chromate-containing paints make effective primers, and Al paints are also good. The best top-coat protection is rendered by Al paints. MEH (32)

Synthetic Resinous Materials Utilized in Making Protective Coatings for Industrial Purposes. WM. T. DEACON. *Oil & Gas Journal*, Vol. 31, Sept. 1, 1932, pages 33-34, 39. The properties and types of synthetic resins for use as protective coatings are described. VVK (32)

Brief Survey on Enamel as regards Composition and Testing Methods. (Kurze Übersicht über das Email hinsichtlich seines Aufbaus und seiner Prüfungsmethoden.) H. I. KARMAUS. *Sprechsaal für Keramik, Glas, Email*, Vol. 65, Dec. 22, 1932, pages 907-908; Dec. 29, 1932, pages 923-925. After a historical survey on development of enamel, physical properties are discussed. Thermal expansion and elasticity are of prime importance for enameled product. Tensile properties, thermal conductivity and turbidity have hardly been studied yet. As to chemical composition it is of doubtful value to establish limiting analyses in attaining properties desired, for instance 3 various powder enamels for bath tubs, widely differing in analysis gave satisfactory results. Testing methods are discussed at length, with special reference to ball drop test and determinations on thermal and chemical resistivity. For thermal resistivity, Vielhaber method is mentioned which is a modified Kinzie method. (*Journal American Ceramic Society*, Vol. 12, 1929, page 188). 9 references. GN (32)

Stability of Paint Coatings on Phosphatized Iron Sheets. (Haltbarkeit von Anstrichen auf phosphatierten Eisenblechen.) FR. KOLKE. *Farben Zeitung*, Vol. 37, Apr. 9, 1932, pages 978-980. Paper opens with discussion on present state of Parker process. Use of a semi-oil coating is strongly advised if paint coating is not applied immediately after parkerizing. Tests are reported on various kinds of lacquers painted upon Fe samples in the following state: (1) as delivered; (2) sand-blasted; (3) phosphatized; (4) sand-blasted + phosphatized. Samples were exposed to attack of salt water spray. In general, a longer life time of the coatings was observed on phosphatized samples than on unprotected metal. Sand blasting in some cases accelerated corrosion attack. Gain in corrosion stability was more pronounced with mineral oils or slightly fatty paints than in case of fatty oil-rich coatings. EF (32)

New Method for the Enameling of Iron Bathtubs, etc. (Neues Verfahren zum Emaillieren eiserner Badewannen usw.) GEORG HUTH. *Emailletechnische Monatsblätter*, Vol. 8, Nov. 1932, page 83. New method facilitates enameling large parts by the powder enameling method. Process is carried on in an electric muffle furnace which can be turned in any desired direction. Whereas in previous methods large pieces had to be reheated several times before enameling was completed, they are enameled in furnace by new method. GN (32)

REVIEWS OF MANUFACTURERS' LITERATURE

Furnaces

An attractive booklet from the R-S Products Corporation presents photographic reproductions of some of the industrial heating problems which have been solved by that organization. Each illustration, of which there are thirty, represents some radical improvement in industrial heat treating equipment. (180)

Artificial Furnace Atmosphere

The Ajax Electric Company is distributing an 8-page article describing the technical and economical advantages of dissociated ammonia gas (75% hydrogen, 25% nitrogen) for use in industrial furnaces and other equipment requiring a reducing atmosphere. (181)

Electroplating Aluminum

A booklet prepared by the Aluminum Company of America as an aid to the practical plater shows that it is as easy to plate on aluminum as on other metals if certain precautions are observed. The method is described in detail, giving the variations necessary for different types of aluminum alloys. Micrographs give a "close-up" of nickel and copper deposits on these alloys. (182)

Dolomite Refractories

Basic Dolomite, Incorporated, has issued a most interesting and attractive pamphlet which presents the case of Clinkered versus Calcined Dolomite in the Basic Open Hearth Steel Furnace. The conclusion reached is that the clinkered product is more economical and in addition provides an easier working furnace and closer control upon refining. (183)

Roll Grinding

An informative, practical booklet dealing with the subject of modern roll grinding practices may be obtained from the Carborundum Company. This booklet has been prepared with the idea in mind of reducing roll-grinding to a science by the removal of variables and the adoption of standardized procedure, and is presented in a clear and concise form. (184)

Casting Steels

A pamphlet describing their Circle L casting steels has been received from the Lebanon Steel Foundry. The first group of steels described are for use where parts are subjected to high stresses, impacts and considerable wear. A page is devoted to their No. 10 steel containing 4½% to 6½% Cr with 0.50% Mo, and the remaining pages to steels of the stainless type, both of the straight chromium and chromium-nickel analyses. (185)

Burners and Burner Equipment

The latest folder from the Surface Combustion Corporation contains data on their burner installations which indicate many interesting economies. A new furnace is not always required to perform some heating operation more economically or to produce better quality. Up-to-date burner equipment may be the solution. (186)

Oil Hardening Steel

The Firth-Sterling Steel Company has issued a folder devoted to their "Invaro" oil-hardening steel, recommended for dies, tools, and similar purposes where the design and requirements call for a steel that will show the least possible change, warpage or damage during heat treatment and that has unusual hardness and toughness. (187)

Wrought Iron

Nordic Iron, a product of the Reading Iron Company, is suggested for use in service where extremely severe vibration is encountered. Because of its characteristically fibrous structure it reacts to vibration stresses like a closely knit bundle of individual wires and for this reason possesses a high resistance to failure due to vibration or fatigue. The leaflet describing it gives its physical properties. (188)

Nickel Alloy Steels

Another useful chart has been prepared by the International Nickel Company, this one being devoted to nickel alloy steels for bars, shafting, simple forging, etc. By setting the chart at the required size and the desired yield point one can read off the recommended steel, its treatment and approximate properties. (189)

Inspection of Steel

Catalogue No. 2 from the Ferrous Magnetic Corporation describes their inspection equipment for strip steel and wire, and weld inspection equipment. Sample oscillograms are shown for determinations of hardness, inclusions, grain size and strain-stress on strip steel. (190)

Chemical Resisting Steel

Bulletin S-66 from the Allegheny Steel Company gives physical data on their Allegheny 66, a chromium alloy steel with high resistance to most chemicals. A table is given which indicates the degree of attack which may be expected from the most generally used chemical reagents. This steel is available in a number of shapes and sizes, a list of which is given. (191)

Cadmium Plating

Udylite is the trade-mark name applied to a process of electroplating with cadmium for protection against rust, corrosion, etc. A description of the process, the necessary equipment and some of its applications will be found in a pamphlet issued by the Udylite Process Company. (192)

Pickling

Bulletin No. 15 from the American Chemical Paint Company describes a new departure in the process of cleaning metals, particularly iron and steel, in which small quantities of the chemical Rodine, when added to the cleaning bath, cheapen the process, produce better work and improve conditions in the cleaning department. (193)

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Modern Melting Methods

A 47-page booklet, Catalog No. 215, prepared by the Whiting Corporation will be found to be a most complete treatise on melting methods, discussing the furnaces used, charging methods and the applications of pulverized coal in the foundry. (194)

Cad-A-Loy Plating

A bulletin issued by the R. & H. Chemicals Department of E. I. du Pont de Nemours & Company covers all phases of Cad-A-Loy plating—preparing the material for plating, making up the solution, operation, analyzing the solution, testing the deposit, etc., and other details. (195)

Continuous Chain Belt Conveyor Furnaces

This furnace was developed by the Electric Furnace Company for treating miscellaneous small and medium size work which should be handled continuously, practically automatically and in quantities at low cost, yet requiring a high degree of accuracy in treatment. Both electric and gas installations are described in a folder recently sent out by them. (196)

Tantalum

A folder from the Fansteel Products Company, Inc., advocates the use of tantalum for pipes, coils, tank linings, agitators, etc. This is, for all practical purposes, a corrosion proof metal, being inert to all corrosives except hydrofluoric acid, hot concentrated caustic or boiling concentrated sulphuric acid. (197)

Copper and Brass

"Copper and Brass for Better Oil Burner Installations" is the title of a booklet received from the Copper & Brass Research Association. Directions for the installation of pipes of these materials are given. (198)

Protective Coatings

Several leaflets from the Dearborn Chemical Company describe the use of their NO-OX-ID for the corrosion protection of aeronautical equipment, railway equipment and the inside of reservoirs and train line piping. (199)

Optical Bench

R. Feuss, Inc., has issued a folder devoted to their universal optical bench which may be lengthened at will. A feature of this bench is the variable angle base which makes possible many experiments with polarized light which are not possible with the straight bench. The same folder illustrates their lens holders, riders and slide tables. (200)

Combustible Gas Analyzer

For testing furnace atmospheres, the combustible gas analyzer manufactured by the Bacharach Industrial Instrument Company will be found useful. The principle of its operation and essential features of construction are described in Bulletin 255 issued by the company. (201)

Control System

The automatic control system described in a pamphlet from H. A. Brassert & Company offers a complete solution for all problems of fuel control and metering, and regulation of atmosphere in melting and heating furnaces in steel works and other industries. (202)

Chemical Microscope

Bulletin No. 8 from E. Leitz, Inc., describes their new chemical microscope. It is of standard size so that with the proper accessories it may be used for observation in transmitted or reflected light, in darkfield, at higher temperatures, etc. (203)

Gas Bench Furnace

The Red Devil Manufacturing Company has sent out a leaflet describing their two burner gas bench furnace which will heat a pair of 10-pound soldering irons in five minutes. Small carbon steel tools, dies or parts can be heat-treated in it or it can be used for melting small quantities of soft metal. (204)

Hot Miller

A booklet from Nielsen & Svenningsen describes the process of hot milling and outlines the outstanding advantages the adoption of the Morgon hot miller ensures. The savings attained are effected by lowering the cost per bit sharpened and the finished bit is said to be superior in quality to that obtained by other methods. (205)

Refractories

The Norton Company has issued No. 1 of *Handling Heat*, a publication on the uses of their refractories. The feature article of this first issue is on enameling furnaces and the application of Alundum refractories to them. (206)

Enameling Zinc Die Castings

A small mimeographed pamphlet from the New Jersey Zinc Company outlines the process of preparing the surfaces of rolled zinc and zinc die castings for lacquering and enameling. No particular finishing system is given because this should be adapted to the individual case. (207)

Lead

The July issue of *Lead*, published by the Lead Industries Association, contains accounts of several interesting and unusual applications of the metal. (208)

Microscopes

A recent catalogue from Carl Zeiss, Inc., describes and illustrates their monocular and binocular microscopes. Prices are given. (209)

Cold Mills

Bulletin P-202 of the United Engineering & Foundry Company describes and illustrates their Precision cold mills, 2-high, 3-high, and 4-high for the cold rolling of sheets and strips in all commercial metals, from heavy gages down to thinnest foils and flat wires. (210)

Welding Rods

A leaflet sent out by the American Brass Company describes their Anaconda welding rods for bronze-welding. (211)

METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

I should like a copy of each piece of Manufacturers' Literature listed below.

.....

Name.....

Position..... Firm.....

Street and Number.....

City..... State.....

NEW MATERIALS and EQUIPMENT

New Corrosion and Heat Resistant Cast Iron

A new corrosion and heat resistant cast iron, with the same coefficient of expansion as plain iron at elevated temperatures, was shown, for the first time, by The International Nickel Company at the exposition of the American Foundrymen's Association in Chicago. Its composition is 28-32% Ni, 4.5% Cr, and the balance cast iron. The new material is very tough, machinable, and maintains its properties without deterioration at high temperatures. This low-expansion nickel-chromium cast iron has a hardness of 140-200 Brinell, and a tensile strength of approximately 30,000 lbs./in.^{2} It is particularly suited for construction requiring heat or corrosion resistant metal in contact with plain cast iron or steel—where the alloy is used as a liner or insert and attains a higher temperature than its surroundings and must consequently pass through the heating and cooling cycles without becoming separated from the base metal enveloping it. Particular examples are bushings and liners for pumps and compressors handling hot liquids or vapors, and for automobile engine valve seat inserts. In such applications, temperature changes in other combinations of material are likely to cause a loosening or crimping of these inserts, depending upon their expansivity.
Metals & Alloys, August 1933

New Grade Carboloy Truing Tool for Wheel Dressing

Carboloy Company, Inc., announce the development of a new grade — Grade 300 — to supplement the two present grades of diamond-impregnated truing tools for finish dressing. The line of Carboloy Truing Tools now cover practically the entire range of finish dressing jobs. Each of the grades contains a specific type of diamond with grade 300 having the best quality stones to accommodate the more difficult dressing jobs. A further development is the sub-division of each grade into 3 groups based on the mesh size of the diamond particles used. These are classified as follows:

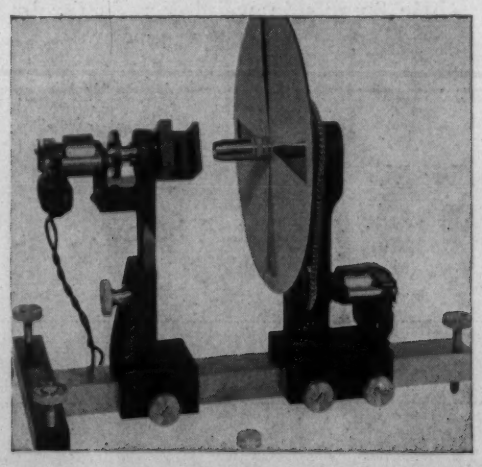
Mesh size of stones:	Fine	Medium	Coarse
Grade 100:	101	102	103
Grade 200:	201	202	203
Grade 300:	301	302	303

This choice of mesh sizes considerably increases the range of work which can be done by any one particular grade and in many cases enables the user to successfully apply a lower-priced grade than would be possible were only one mesh size available. Similarly, the 3 grades of stones now available offer opportunities for economies as the user may select the exact grade most suitable for his work, eliminating the necessity of purchasing more expensive stones when less costly ones will do the job satisfactorily.
Metals & Alloys, August 1933

New Base for Resin Laminating

Recent investigations at Mellon Institute of Industrial Research, Pittsburgh, Pa., have resulted in the adaptation of "Robertson Bonded-Metal" (R-B-M) to meet the needs of the resin-laminating industry. The new material facilitates the manufacture of decorative resin finishes. The fiber-coated metal "R-B-M" offers ideal anchorage for resin adhesives, and, when penetrated by the resin, gives a fiber-reinforced glue line with both fibers and adhesive attached to the metal, resulting in a bond approximately 45% stronger than is possible by present methods of attachment to etched steel. Further advantage lies in the fact that the fibrous layer serves the very important function of supplying a cushioning action between the relatively non-compressible metal and veneer layers, thus insuring a more uniform contact and adhesion in the laminating operation.
Metals & Alloys, August 1933

Precision Back-Reflecting X-Ray Camera



The instrument illustrated was designed by the American Instrument Company for the study of the composition of metals and other crystalline substances by the X-ray diffraction method. A pencil of rays passes through a hole in the center of the disc that carries the film, impinges on the specimen, and is broken up and reflected back onto the film. Each homogeneous substance so treated gives a characteristic series of rings on the film, so that the constituents of a complex or alloy specimen may be identified from the ring-pattern produced. A feature of the instrument illustrated is that both specimen and film disc are rotated as the picture is being made. The effect is as though the number of exposed crystals in the specimen face were greatly increased, and in the resulting picture the rings are much sharper and easier to identify than in the stationary type.
Metals & Alloys, August 1933

New Welding Electrode

Two additions to the Murex line of heavy mineral coated arc welding electrodes are announced by the Metal & Thermit Corp. One is a special electrode designed for welding Cromansil Steel, a new development in high strength steels having a tensile strength of 80,000 to 100,000 lbs./in.^{2} along with high ductility. The new electrode, it is claimed, gives a deposit of the same analysis as Cromansil. The weld metal has physical properties which are equal to the parent metal in every respect. The second addition to the Murex line is an electrode which deposits a metal containing 4% to 6% Cr and .5% Mo. It is specially suited to the welding of petroleum refinery equipment where metal of this type is used extensively.
Metals & Alloys, August 1933

Zinc-Coated Wire

The Bethlehem Steel Company uses a new process for zinc coating called "Bethanizing." It is claimed that coatings two and even three times as heavy as can be applied by other processes are possible. The zinc coating on Bethanized wire is so ductile and adherent to the base that, even when heavily coated, it can be put through severe bending and forming operations without risk of damage.
Metals & Alloys, August 1933

Carboloy Tips Increase Life of Hydraulic Valve Stems and Seats

The latest use of Carboloy cemented carbide is its application as wear resistant inserts on hydraulic valve stems and seats. Valve stems and seats in hydraulic presses, pumps, rams, etc., are subject to such high abrasion and pressure that frequent replacements are necessary to insure accurate pressure control. By tipping these stems and seats at their wear-points with extremely hard Carboloy cemented carbide, it is claimed that accurate pressure control is provided over long periods of uninterrupted use, less maintenance expense is incurred and replacement costs are substantially reduced.
Metals & Alloys, August 1933

Universal Optical Bench

Hundreds of different set-ups are possible by variously arranging the several principal parts and the many auxiliary attachments of this ingenious new outfit of R. Fuess, Inc. A rough idea of its flexibility may be had by examining

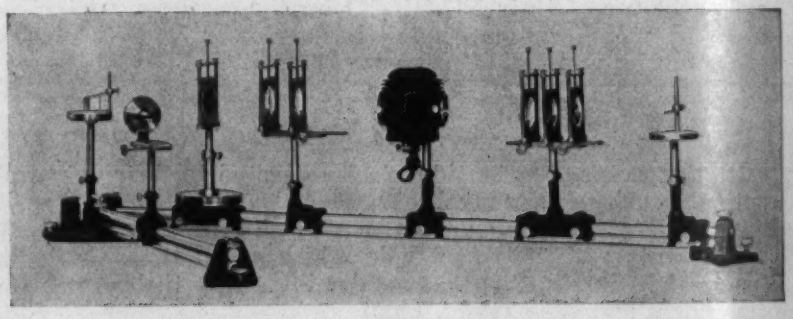


Fig. 1

Fig. 1 which shows (left to right) a fixed-angle base, a slide table, a single lens holder (on a revolving-unit rider), a duplex lens holder, a lamp house, a triplex lens holder and a turntable, as well as 2 supporting bases. The bench proper is constructed of two ¾" chromium-plated steel rods which come in standard lengths of 500, 1000 and 2000 mm., so that over-all bench length can be increased by inserting a longer bar, whereas in present type precision benches a length of 2 m., for example, would be costly. The variable angle base, Fig. 2 (not shown in Fig. 1) is said to open up new fields of optical-bench experiments, including as it does a 5" disc with verniers permitting readings to <5' and a standard post which can accomodate any of the platforms of other holding devices in the new Fuess line. The manufacturer's announcements state that "such attachments or devices as you may already possess" may in like manner be fitted for use with this universal bench.
Metals & Alloys, August 1933

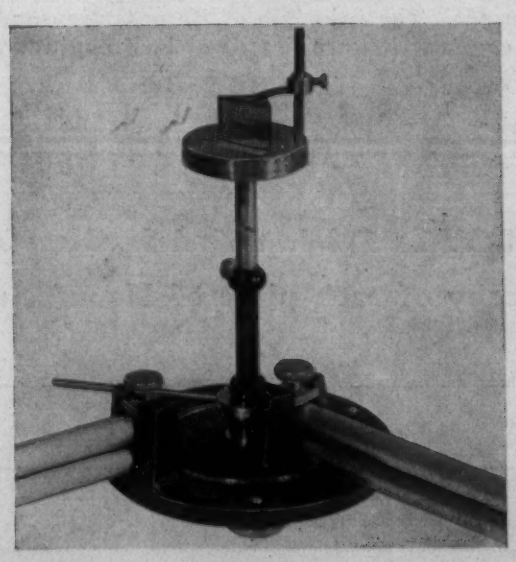


Fig. 2

PROPERTIES OF METALS (1)

Change of Reflecting Power of Bismuth by Magnetization. (Ueber die Aenderung des Reflexionsvermögens des Wismuts durch Magnetisierung.) E. ENGLERT & K. SCHUSTER. *Zeitschrift für Physik*, Vol. 79, Nov. 14, 1932, pages 194-196. Polycrystalline Bi does not change reflecting capacity in a magnetic field. Therefore conductivity of Bi is not a normal electron conductivity. Ha (1)

Ferromagnetic Moments and Periodic System. (Moments ferro-magnetiques et systeme periodique.) CH. SADRON. *Comptes Rendus*, Vol. 193, Nov. 30, 1931, pages 1070-1073. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 58. OWE (1)

Investigations into Equilibrium of Reduction, Oxidation and Carburization Phenomena in Iron. XII. The Gas-Analytic Micromethods. (Gleichgewichtsuntersuchungen über die Reduktions-, Oxydations-und Kohlungsvorgänge beim Eisen. XII. Die gasanalytischen Mikromethoden). RUD. SCHENCK & TH. DINGMANN. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 209, Nov. 1932, pages 1-10. Describes principally a micro-analysis for determination of nature of gases generated in reduction, oxidation and carburization of Fe; this is mostly CO, either pure or mixed with other CH_4-H mixtures; very small amounts (2-3 cc.) of gas suffice for analysis. Ha (1)

The Influence of Cold-Working on the Temperature of the Beginning of the Gray Radiation. (Der Einfluss der Kaltbearbeitung auf die Temperatur des Begins der Grauglut.) G. TAMMANN, F. NEUBERT & W. BOEHME. *Annalen der Physik*, Series 5, Vol. 15, Nov. 1932, pages 317-320. Heating up to 400° C. causes metals and other substances to emit a weak light, the gray radiation which is of less intensity in opaque than transparent substances. Cold-working of metals apparently reduces this temperature only very slightly while salts showed on pulverization a reduction of 50-150° C. Complete tables of temperatures of a great number of substances are given. Ha (1)

The "Cry" of Tin. *Tin*, Aug. 1932, pages 14-15. When bending Sn it oftens emits a sound; due to the twinning which occurs when single crystals or cast rods (polycrystalline) are bent. Same phenomenon has been observed in Zn and Cd. In general it seems to occur only in metals crystallizing in the hexagonal system. Ha (1)

Entropy, Heat Content, and Free Energy of Iron. J. B. AUSTIN. *Industrial & Engineering Chemistry*, Vol. 24, Dec. 1932, pages 1388-1391. Tables of entropy, heat content (total heat), and free energy of both forms of Fe are given for temperature range — 250° to 1600° C. It is shown that in accordance with prediction of thermodynamic theory heat of transition changes sign between the transition points. MEH (1)

Formation Heat of Indium Trioxide and Germanium Dioxide. (Die Bildungswärmen von Indiumtrioxyd und Germaniumdioxyd.) G. BECKER & W. A. ROTH. *Zeitschrift für physikalische Chemie*, Abt. A, Vol. 161, Aug. 1932, pages 69-76. Highly pure metals burnt in calorimetric bomb yielded following data at 20° C. and constant vapor pressure: In_2O_3 = 22.5 kcal. ± 1/3% and GeO_2 = 128.1 kcal. ± 1/2%. Specific weight of pure In at 24° C. under water was determined as 7.28_2 ± 1%. Incomplete oxidation of metals and tendency towards volatilization at elevated temperatures is fully dealt with. EF (1)

Mechanical Properties of Nickel Wires. C. E. RANSLEY & C. J. SMITHELLS. *Engineering*, Vol. 134, Oct. 7, 1932, page 409; *Metal Industry*, London, Vol. 41, Sept. 30, 1932, pages 323-324. Abstract of paper read before the Institute of Metals, Sept. 1932. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 2. LFM + Ha (1)

Change of Resistance of Ferromagnetic Crystals. (Widerstandänderung ferromagnetischer Kristalle.) R. GANS & J. VON HARLEM. *Annalen der Physik*, Series 5, Vol. 15, Dec. 1932, pages 516-526. Theoretical treatment of changes of resistance of ferromagnetic mono-crystals in a magnetic field on basis of Heisenberg's symmetry and saturation principles. 8 references. Ha (1)

Magnesium. JOHN A. GANN. *Metal Industry*, N. Y., Vol. 30, June 1932, pages 235-238. A review of the production and applications of Mg and its alloys is given. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 2. PRK (1)

Ferromagnetism and Electrical Properties. IV. (Ferromagnetismus und elektrische Eigenschaften. IV.) W. GERLACH. *Annalen der Physik*, Series 5, Vol. 12, Mar. 1932, pages 849-864. Results of investigations on magnetic resistance can be summarized briefly: Above Curie point, Ni reduces its magnetic resistance as the square of true magnetization, that is of interior magnetic energy. Increase of magnetic resistance in ferromagnetic range is proportional to total magnetization and due to torsional processes during magnetization. Tests are reproduced. Ha (1)

The Thermal Expansion of Zinc at High Temperatures. (Die Ausdehnung des Zinks bei steigenden Temperaturen.) H. SIEGLERSCHMIDT. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 198-200. Irregularities in thermal expansion of polycrystalline Zn and in shearing strength of single crystals of Zn in neighborhood of 150°-200° C. are ascribed to impurities. Effect may be diminished greatly by heat-treatment. RFM (1)

Some Notes on the Common Uses of Nickel. ANTONY SETON. *Metal Industry*, London, Vol. 41, Sept. 9, 1932, pages 243-245. General metallurgical facts on Ni, its uses in alloys, effect of alloying materials on properties, uses in industries and especially in plating are described. Ha (1)

The Supposed Allotropy of Antimony. (Über die angebliche Allotropie des Antimons.) A. SCHULZE & L. GRAF. *Metallwirtschaft*, Vol. 12, Jan. 13, 1933, pages 19-21. The claim that Sb passes through a transformation at about 106° C. or between 125° and 137° C. was investigated by electrical resistance and dilatometric measurements and X-ray examination of c.p. Sb. Total impurities in the Sb were .0003%. The electrical resistance curve of a polycrystalline sample which had been annealed at 200° formed a straight line up to 105° C. Between 105° and 110° C. there was a break, then the straight line continued. This condition was completely reversible. But the electrical resistance-temperature curves of a polycrystalline sample annealed at 600° C. and of a single crystal of Sb were perfectly straight. In another sample which consisted of several large crystals the irregularity appeared at 165° C. It also disappeared when the sample was annealed at 600° C. Apparently the break in the curves was due to mechanical deformation instead of a transformation. Dilatometric measurements also showed a break above 100° which disappeared when the samples were annealed at 600° C. The X-ray diffraction patterns of Sb taken at room temperature and at 210° C. were identical, showing that no allotropic transformation takes place. 7 references. CEM (1)

Ferromagnetism and Electrical Properties. VI. Longitudinal and Transverse change of ferromagnetic Resistance. (Ferromagnetismus und elektrische Eigenschaften. VI. Longitudinal und transversale ferromagnetische Widerstandsänderung). ERNO ENGLERT. *Annalen der Physik*, Series 5, Vol. 14, Aug. 1932, pages 589-612. Notes to foregoing paper regarding the resistance change in iron crystals. W. GERLACH. Pages 613-616. Principal conclusions from experiments with change of magnetic resistance in very high magnetic fields are: resistance in both directions decreases in proportion to square of spontaneous magnetization; formula giving change of resistance as function of change of direction of magnetizing vectors is derived. Relation between increase of longitudinal resistance and decrease of transverse resistance is determined. Gerlach reports measurements for a few special cases in crystals through which current passes. Ha (1)

Strategic Metals. The Value of Tin. *Tin*, Aug. 1932, pages 3-4. Great importance of Sn as alloying and coating material is pointed out, no substitute for it having so far been found. Resistance of Sn alloys to wear, impact and pounding is illustrated by few tests of bearing alloys made in England and U.S.A. Ha (1)

Lithium. Pamphlet issued by Imperial Institute, Mineral Industry of British Empire and Foreign Countries, 1932, 27 pages. Published by H. M. Stationery Office, London, price 6 d. Location of Li minerals throughout the world is given. Metallurgical uses of Li in Al and Be alloys, as a deoxidizer for Cu and as a hardener of Pb in "Bahnmetall" are very briefly mentioned, with references to the literature. Uses for Li compounds are also discussed. Bibliography and footnotes contain some 75 references. HWG (1)

Diffraction of Electrons by Single Crystals of Au and Pt (Recherches sur la diffraction des électrons par des cristaux uniques d'or et de platine). J. J. TRILLAT & TH. v. HIRSCH. *Comptes Rendus*, Vol. 194, Jan. 4, 1932, pages 72-74. Changes in diffraction caused by annealing beaten Au leaf, as well as diffraction by single crystals of Pt, are studied. Effect of annealing is to cause structural changes which can be directly followed in diffraction pattern formed on a fluorescent screen. Above 500° C. recrystallization commences and complete Debye-Scherrer rings are shown. With Pt there are 2 orientations of cubic crystals, and diagrams may be interpreted as due to a slightly deformed, 3-dimensional crystal. With Pt foil sharper patterns are obtained, crystals being less deformed than those of Au. OWE (1)

The unusual metal or alloy of today may be the usual metal of tomorrow.

You will profit by looking over this section as well as the sections on non-ferrous and ferrous alloys.

Some Properties of Pure Silicon. R. L. TEMPLIN. *Metals & Alloys*, Vol. 3, June 1932, pages 136-137, 150. Reports a determination of modulus of elasticity for Si. Specimens contained .29% Fe, 0.15% Al, smaller but determined amounts of Cr, Ti, Mn, Cu, V, and Mg with Si 99.41% by difference. Spectroscopic examination revealed presence of Be, Ca, Ag, Li, Pb and Na. Cast material had a hardness in excess of 105 "C" Rockwell and Young's Modulus for material was 16,350,000 lbs./in.^{2}. Micrographs of material are shown. WLC (1)

The Principal Factors in the Castability of Pure Metals. (Facteurs Principaux de la Coulabilité des Métaux Pure.) A. PORTEVIN & P. BASTIEN. *La Fonderie Belge*, Vol. 2, June 1932, page 110. See *Metals & Alloys*, Vol. 3, Sept. 1932, page MA 261. FR (1)

Reflecting Power of Very Thin Metallic Films (Sur le pouvoir réflecteur des métaux en lames très minces). P. ROUARD. *Comptes Rendus*, Vol. 195, Nov. 14, 1932, pages 869-870. Films were obtained by cathodic sputtering on face of a glass prism with an angle of 2 to 3°. Thickness of metal was found by weighing a cover-glass sputtered with metal at same time and under same conditions as prism. Weighings were made by a microbalance sensitive to 0.001 mg., giving thickness to 2 or 3 tenths of a millicron. Reflecting power for normal incidence of monochromatic light was obtained by allowing the light to pass through the uncovered surface of the prism and to fall perpendicularly on the metallic film. The reflected beam, after leaving the prism, is reflected at 45° by a plate and then passes to a camera. The photograph obtained is then studied by the standard methods of photographic photometry. The results, which refer to a reflecting power of metal in contact with glass, are tabulated, the reflecting power glass—air being taken as unit. The metals used are Au, Ag and Pt. OWE (1)

The Spark Spectrum of Arsenic. MELA RAM. *Indian Journal of Physics*, Vol. 7, Pt. IV, Sept. 1, 1932, pages 299-305. Accurate data for spark spectrum of As which has so far been lacking is provided in the visible and near ultraviolet regions. In all about 130 lines have been measured, majority of which are new. Experimental arrangement of lines suggest that they are probably due to singly ionized As. GN (1)

Metallic Films and Surfaces. (Metallische Filme und Flächen.) K. RICHTER. *Kolloid Zeitschrift*, Vol. 61, Nov. 1932, pages 208-218. Metallic films of colloidal dimensions show often quite different properties from solid metal and find technical application in photo-cells, rectifiers, mirrors, etc. Such thin films can be produced in different ways as follows:

	Example	Least Thickness of Film
1. Mechanical Methods:		
a. Rolling	Aluminum foil	4 μ
b. Hammering	Gold leaf	50 m μ
c. Spraying	Protective coating (Schoop)	
2. Chemical Methods:		
a. Electrolysis	Cr plating for protection against corrosion	any
b. Reduction	Silver mirror	50 m μ
c. Thermal disintegration	Iron mirror from Fe carbonyl	any
3. Condensation Methods:		
a. Thermal evaporation	Grids in amplifying tubes	any
b. Cathodic atomization	Surface mirrors	any

Mechanical, optical, magnetic and photo-electric properties, reacting capacity and structure of films are discussed and practical applications described. 48 references. Ha (1)

Constitution of Colloidal Gold. (Die Konstitution des kolloiden Goldes.) W. PAULI. *Die Naturwissenschaften*, Vol. 20, July 22, 1932, pages 551-557; July 29, 1932, pages 573-576. Lecture before 5 physical and chemical associations at Vienna, Feb. 1932, in which contributions of Zsigmondy, Freundlich, Kautsky, Bredig, Pauli and co-workers, Blank-Valko, Brunner-Russier during past 12 years to the problem of constitution of colloidal Au are historically reviewed in great detail. EF (1)

Volatilization Tests with Polonium. (Verdampfungsversuche an Polonium.) E. RONA. *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Klasse*, Abt. IIA, Vol. 141, No. 8, 1932, pages 533-537. Volatilization experiments with Po on Au, Pt and Pd carriers are carried out. It was established that Po volatilizes at by far higher temperatures from Pd than from Au and Pt. This phenomenon is coupled with the peculiar behavior of Pd towards H in which regard it differs from the other metals. Old and newly made preparations of Au show much greater divergencies among each other than similar preparations of Pd. This is ascribed to a gradual migration of Po into the Au carrier. WH (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

Some Attempts at Making Beryllium-Magnesium Alloys. R. J. M. Payne & J. L. Haughton. *Metal Industry*, London, Vol. 41, Sept. 23, 1932, pages 299-300. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 2. Ha (2)

Notes on Manganese-Bronze. F. A. W. Livermore. *Metal Industry*, London, Vol. 41, Aug. 19, 1932, pages 175-176; *American Metal Market*, Vol. 39, Sept. 2, 1932, page 6. Due to high corrosion resistance behavior of Mn bronze this alloy (although containing only little Mn in spite of its name) is widely used in mining machinery and marine construction; usual composition is Cu 55-60%, Zn 35-40%, Fe 1-1.5%, Mn 0.25-3.0%, Al trace to 1.0%, Sn trace to 1.0%, Pb 0.25-0.5%. Scrap gives just as good a material as virgin metal provided no injurious impurities are in scrap. Alloy is made in graphite crucibles heated in a coke-fired pit-furnace. Directions for melting are given. The tensile strength is about 72,000 lbs./in.^{2}, yield point 50,000 lbs./in.^{2}, elongation 21%. DTR + Ha (2)

Factors Affecting the Physical Properties of Cast Red Brass (85 Cu, 5 Zn, 5 Sn, 5 Pb). H. B. Gardner & C. M. Saeger, Jr. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 517-535; *Metal Industry*, London, Vol. 41, Aug. 19, 1932, pages 181-183; Aug. 26, 1932, pages 199-200. This investigation, sponsored by Non-Ferrous Ingot Metal Institute at Bureau of Standards, was restricted to study of alloy having 85% Cu and 5% each of Zn, Sn and Pb. 4 types of test bars were cast at each of 5 pouring temperatures, 1900°, 2000°, 2100°, 2200° and 2300° F. Relation between tensile strength, Brinell hardness, electrical resistivity and density and pouring temperatures was determined. Best physical properties were obtained on those test bars poured at 2000° and 2100° F. There was no marked difference in physical properties of test bars made from virgin metal and from remelted metal. Somewhat better running qualities were obtained with remelted metal cast in green-sand molds than with virgin metal cast under same conditions. Physical properties obtained with end-gate type of sand-cast test bars were in general superior to those obtained with fin-gate type of bars. This was also true of cast-to-size sand-cast test bars as compared to machined-to-size sand-cast test specimens. Test specimens having superior physical properties were also more uniform in their structure. Strain markings indicative of permanent straining as a result of cooling stresses were found in microstructure of all sand-cast bars poured at higher temperatures. Shrinkage of alloy was determined from a temperature above highest pouring temperature used to room temperature. No difference was found in shrinkage of virgin and remelted metal. Determination of linear contraction of a sand-cast bar showed a definite expansion just below solidus temperature. VVK (2)

The Constitution of the Lead-Tin Alloys. D. Stockdale. *Metal Industry*, London, Vol. 41, Sept. 23, 1932, page 300. See *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 33. Ha (2)

Brass, Bronze and Copper Alloys. W. R. Hibbard. *American Metal Market*, Vol. 38, Dec. 11, 1931, pages 3, 5; Dec. 12, 1931, pages 3, 5. Presented at Conference on Metals and Alloys, Cleveland, Nov. 18-20, 1931. See *Metals & Alloys*, Vol. 3, June 1932, page MA 159. DTR (2)

Mechanical Properties of White Metal Bearing Alloys at Different Temperatures. H. K. Herschmann & J. L. Basil. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 536-557. Includes discussion. Present report gives data on resistance to wear, to impact (Izod test), and to pounding (repeated impact), strength in compression and Brinell hardness of 10 bearing alloys including 2 Sn-base (84-91% Sn, 8-5% Sb, 8-5% Cu), 7 Pb-base (62-96% Pb, 20-0% Sn, 15-0% Sb) and one Cd-Zn (82-18) alloy. Tests covered range from 20° to 200° C. with exception of resistance to wear which was determined only at 20° C. No one of bearing alloys used was found to excel in all mechanical properties which are believed to indicate suitability of a bearing metal for service. Sn-base alloys showed a lower wear-rate at 20° C. and in most cases had higher single-blow impact resistance at temperatures between 20° and 200° C. than Pb-base and the Cd-Zn alloys. In most cases, Sn-base alloys showed lower resistance to pounding at temperatures up to 200° C. than other alloys, most notable exceptions being Pb-Sb alloys containing less than 5% Sn. Hardness and compressive properties of Sn-base alloys were lower than those of "hardened Pb" and the Cd-Zn alloys. Pb-Sb-Sn alloys showed in most cases higher mechanical properties as the content was increased. Results indicate that alkaline metal hardened Pb and Cd-Zn alloys had higher hardness, greater resistance to deformation under pounding and better compression properties at temperatures up to 200° C. than the Sn-base and Pb-Sb alloys. Service tests conducted in Class B Army trucks showed that the Sn-base alloys were superior in their wear resistance to both the "hardened lead," and Pb-Sb-Sn alloy containing 3% Sn. These results were consistent with the laboratory results on wear. VVK (2)

American Progress in Beryllium Copper. *Engineering Progress*, Vol. 3, Sept. 1932, pages 364-365. Recent investigations in physical properties of Be-Cu alloys are reviewed. These alloys are of precipitation or age hardening type; best effect is obtained with 1¼ to 1½% Be. Effect of cold-rolling strips without further heat treatment shown in table:

Reduction	50%			75%			90%		
Be%	Tens. Str. lb./in.^{2}	El. % in 2 in.	Hardness	Ten. Str. lb./in.^{2}	El. % in 2 in.	Hardness	Ten. Str. lb./in.^{2}	El. % in 2 in.	Hardness
0.34	74,900	3.0	140	93,000	2.50	152	105,000	1.0	160
1.24	114,100	2.75	185	140,000	2.00	200	160,000	1.0	205
1.36	120,000	3.0	185	144,000	1.75	208	167,000	1.0	210
1.68	123,400	2.03	190	152,800	2.00	220	176,500	1.0	230
1.91	132,300	3.0	215	158,000	1.50	230	—	—	—
2.20	139,200	3.0	225	162,000	1.50	240	—	—	—
2.51	147,600	3.0	255	—	—	—	—	—	—

Hardness is given in Monotron readings due to thinness of sheets. Coil springs made from Be-Cu have been deflected 6,000,000 times without sign of failure while a similar spring of high-grade bronze spring wire failed after 400,000 deflections. Besides, Be-Cu springs can be operated at 350° C. without softening or recrystallization. The Brinell hardness of age-hardened Be-Cu's is about 400, they have therefore a high resistance to abrasion and wear. Ha (2)

Magnesium-Tin Alloys. *Tin*, Aug. 1932, pages 4-5. An alloy of especially good casting and corrosion resisting qualities is given as 91% Mg, 6% Sn, 1% Cd, 1% Zn, Mn 1%. Physical properties can be improved by heat treatment. Ha (2)

Stellite and "Festelmetal." (Stellit und Festelmetall im Werkzeugbau.) *Das Werkzeug*, Supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Oct. 10, 1932, pages 115-116. Survey of properties of stellite is given. When this material must possess plasticity and machinability, for certain purposes, a certain percentage of Fe is added. This material is then known as "Festelmetal." It can be forged at bright red heat and can be worked with a file when it also contains Ni. GN (2)

Beryllium Copper. *Product Engineering*, Vol. 3, Dec. 1932, pages 494-495. Physical properties of a cast beryllium copper of 2¼% Be are given as follows: ultimate tensile strength 110,000-120,000 lbs./in.^{2} yield point 85,000-90,000 lbs./in.^{2} Brinell hardness 375-400, electrical conductivity 32-35% of standard annealed Cu, thermal conductivity about same relative to Cu as electrical conductivity. Be-Cu alloys can be die-cast without difficulty and have somewhat better properties. Be has a good deoxidizing effect on Cu-castings. Curves of conductivity for Be-contents form 0.4 to 3.6% by weight and with different heat treatment are given, as also a few examples of cast machine parts. Ha (2)

The Influence of Design on Brass and Bronze Castings. Lewis H. Fawcett. *Transactions American Foundrymen's Association*, Vol. 3, Nov.-Dec. 1932, pages 360-374. Composition and required physical properties of some bronzes and brasses used by the Navy Department are given. The fundamentals of design are discussed and many examples of poor design are shown with improvements to overcome the defective design. CHL (2)

Bismuth Alloys. H. W. Gillett. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 92-94. Extended abstract of 3 papers by J. G. Thompson giving curves of physical properties of Pb-Bi and Pb-Sn alloys. Mechanical properties of various type metals are tabulated. Data is given on physical properties and thermal characteristics of fusible alloys. WLC (2)

Alloys of Palladium with Antimony. (Ueber Legierungen des Palladiums mit Antimon.) A. T. Grigorjew. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 209, Dec. 1932, pages 308-320. Constitutional diagram of Pd-Sb system was developed and microstructure, electric conductivity and its temperature coefficient determined. Existence of compound Pd_5Sb_3 is confirmed. 8 references. Ha (2)

Alloys of Gold with Antimony. (Ueber die Legierungen des Goldes mit Antimon.) A. T. Grigorjew. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 209, Dec. 1932, pages 289-294. Electric conductivity curves for continuous series from 0-100% Sb and their temperature coefficients were determined and found in agreement with results of thermal analysis; existence of previously found compound $AuSb_2$ was confirmed. 11 references. Ha (2)

The Use of Alloys of Magnesium (Maximum Working Qualities and Minimum Normal Tolerances). [Utilisation des alliages de magnésium (qualités maxima des fabrications et tolérances minima dés normes).] R. de Fleury & Benmakrouha. *Comptes Rendus*, Vol. 194, May 17, 1932, pages 1739-1741. Deals with methods of assigning definite numerical values to such qualities of a metal or alloy as change with repeated treatment (re-fusion, etc.) of material. Convenient measures for margin of depreciation of a certain property, coefficient of elementary depreciation, gross and net yield, minimum normal tolerance, etc., are given. OWE (2)

White Metal Bearing Alloys. Leland E. Grant. *Metals & Alloys*, Vol. 3, June 1932, pages 138-145, 150; July 1932, pages 152-158. Reviews literature on bearing alloys covering 55 references. Essential characteristics of bearing metals are discussed and their relation to quantitative measurements of compressive strength and other physical properties. Diagram covering useful compositions of Sn-Sb-Cu bearing alloys is discussed with microstructure of alloys. Tables show ultimate strength and hardness of various compositions, effect of pouring temperature upon hardness, and effect of such impurities as Bi, As, S, and Fe upon hardness. Effects of impurities are discussed at length first as they affect base, Sn, and then as they affect Sn-Sb-Cu alloy. Impurities whose effects are discussed are Pb, Ni, As, Bi, Al, Mg, Zn, Fe and SnO_2. Variations of Cu and Sb are discussed. Compositions of S.A.E. babbitts are given and micrographs show typical structures of commercial alloys. Part II discusses Pb base alloys. Pb-Sn-Sb equilibrium diagram is discussed and various constituents occurring in various ranges of composition tabulated. Tendency of these alloys to segregate from top to bottom is discussed with micrographs and compositions given in various parts of ingots. Effects of several impurities, Bi, As, Zn, Cu, are discussed. Variations in Sn and Sb proportions are discussed in light of application. Compositions of commercial alloys are tabulated with their applications given. WLC (2)

Technic Alloys for Inlay Casting. G. S. Easton & K. W. Ray. *Dental Cosmos*, Vol. 74, Oct. 1932, pages 972-976. "Technic alloys" in dentistry refers to alloys which are used in practice casting and demonstration models in place of precious metal alloys. The requirements of such alloys are given. One of the earliest alloys to be used contained equal weights of Ag and Cu. Later alloys used for this purpose contained: A-Cu 13.7, Ag. 82.2, Au 4.1%; B-Cu 65.5, Ag 34.4, Au 0.13%; C-Cu 12.6, Ag 86.8, Ni 0.6%; D-Cu 4.9, Ag 68.7, Sn 26.4%. "Postizo" metal which sold for $5.00 per oz. was found to contain Cu 86.9, Al 9.8, and Sn 2%. In a series of 11 alloys studied, one was found which closely approached the properties of casting gold B. Its composition was Cu 67, Ag 12, Zn 20, Si 1%, and its properties were: tensile strength 42,000 lb./in.^{2}, yield point 22,000 lb./in^2, elongation in 2 in. 14%, Brinell hardness 84, and melting range 1705-1725° F. The cost of this alloy at existing metal prices is not over $1.50 per lb. 3 references. OEH (2)

Colored Gold Alloys. (Farbige Goldlegierungen.) E. Vincke. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle*, Vol. 6, Apr. 1932, pages 1-8. Au alloys of different colors belong mostly to system Au-Ag-Cu, the more Cu the redder, and the more Ag, the more yellow is the product. Very pale Au colors are obtained by a further addition of Zn. Green Au in different tints is made by additions of Cd, or of Au and Ag alone, or with little Cu. A "blue" gold with addition of Fe cannot be made notwithstanding statements to contrary as Fe does not alloy very well. A purple alloy of 78.5% Au and 21.5% Al is very brittle and cannot be rolled; melting point is 1000° C. Coloring of Au alloys can also be obtained by surface treatment of any Au alloy, or by electroplating. Tables of a variety of alloys, their colors, treatment and melting points are given. Ha (2)

14-Carat Standard legalized for Gold Wares. Ernest A. Smith. *Metal Industry*, London, Vol. 41, Sept. 16, 1932, pages 267-270. This composition has been legalized in Great Britain. Comparative physical properties and melting points for this alloy with varying amounts of Ag and Cu making up addition to Au are tabulated. Ha (2)

New Gold Alloys. (Neue Goldlegierungen.) L. Sterner-Rainer. *Deutsche Goldschmiedezeitung*, Vol. 36, Jan. 14, 1933, pages 29-30. Reviews composition and properties of Au alloys containing Au and Zn; Au and Cr; Au, Cr, Cu and Ag; Au, Ag, Mo, Cu, Ni and Cr; Au and Si; Au and Al; Au, Ag, Pd and Pt. GN (2)

Diffusion of Metals in Solid Lead. (Über die Diffusion von Metallen in festem Blei.) W. Seith & J. G. Laird. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 193-196. Rates of diffusion of Ag, Bi, Tl, and Sn into solid coarse-grained Pb were studied. Around Pb cylinders alloys of aforenamed elements with Pb were cast, and after various time periods layers were removed by machining and analyzed, Ag and Bi, Sn, Tl spectroscopically by reference to standard spectra of known mixtures of the 2 metals. 4 temperatures were chosen, 220°, 245°, 265°, and 285° C. Logarithm of diffusion coefficient D plotted against $\frac{1}{T}$ gave a straight line for each metal pair, permitting a calculation of heat of lattice "loosening" Q (*Auflockerungswärme*). At 285° C. diffusion coefficients were found to be Ag: 0.79×10^{-2}; Bi: 3.8×10^{-5}; Tl: 2.7×10^{-5}; Sn: 1.4×10^{-5}; Pb (self-diffusion): 6×10^{-6} cm^2/day. Rate of diffusion is the faster the greater the chemical difference of elements concerned; Q is the greater the greater the chemical difference. Rates of diffusion parallel solid solubilities approximately but not exactly. From concentration levels in cast and annealed pieces, limit of solubility can be approximated; since this applies as well to limited solubilities as to extensive, the method appears useful in evaluation of very small solid solubilities. RFM (2)

Thermo-Electric Behavior of Tungsten, Molybdenum, and Tantalum. (Über das thermoelektrische Verhalten von Wolfram, Molybdän und Tantal.) A. Schulze. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, page 206. Data are given for thermoelectromotive force developed in couples Pt-Mo, Pt-W, Pt-Ta, Ta-W, W-Mo over temperature range — 190 to 1400° C. in steps of 100°. RFM (2)

Properties of Zinc Base Die Castings. *Metal Industry,* N. Y., Vol. 30, Dec. 1932, pages 470-472. Numerous tables list properties of several alloys made from high purity Zn with about 4% Al and up to 3% Cu and up to 0.04% Mg. Impact strength runs around 15-20 ft. lbs. to break ¼" square bar. When plated with Ni and Cr, undercoat of Ni should have a minimum thickness of 3/10,000" and the Cr 2/100,000". One of disadvantages in past of Zn base die cast alloys has been their tendency to warp or grow with age. This tendency has been practically overcome with use of Mg in minute quantities. PRK (2)

Annealing and Quenching of Bronze Castings. (Glühen und Abschrecken von Bronzegussstucken.) *Kali, Erz und Kohle,* Vol. 29, Oct. 10, 1932, pages 160-161. Improvement of mechanical properties of a Sn bronze (88.5% Cu, 9.5% Sn and 2% Zn) by annealing between 600° and 800° C. for ½ hr. and subsequent slow cooling is discussed. This improvement can be effected on all casting bronzes. In Al bronzes (90-95% Cu, 10-5% Al) tensile strength increases with increasing Al content but alloys above 10% Al are too brittle. It is shown how quenching and annealing affects tensile strength and toughness of a bronze containing 89% Cu, 10% Al, 1% Fe. Since the properties can be varied by this treatment within wide ranges such alloys are fit for highly strained parts, as gears, pistons or other motor parts, and for chemical apparatus, pumps and compressor parts due to a high corrosion resistivity. GN (2)

Properties and Utilization of Some Magnesium Alloys. (Eigenschaften und Verwendung einiger Magnesiumlegierungen.) *Die Metallbörse,* Vol. 22, Mar. 12, 1932, page 323. Absence of crystal growth and air hardening properties, low weight and great resistance toward atmospheric corrosion and relatively large strength at ordinary temperatures of Mg-alloys are emphasized. Following data are given: cast Mg: 9.1 kg./mm.^{2} tensile strength; pressed pure Mg: 19.6. kg./mm.^{2} tensile strength. An alloy of 95.7 Mg, 4 Al and 0.3 Mn is used for forging, rolling and pressing material of maximum ductility. Raising Al content to 6% besides 93.7% Mg and 0.3% Mn, a sound casting alloy with a tensile strength of 19.6-21.7 kg./mm.^{2} is secured. High strength values are obtained by raising Al content; for instance, 91.8 Mg, 8 Al, 0.2 Mn show 16.1-18.9 kg./mm.^{2} in as cast state and 21.7-24.5 kg./mm.^{2} after heat-treatment. A Mg alloy containing 2 Al, 2 Cd, 4 Cu, outstanding by its favorable thermal properties, is widely used as piston alloy of 15.4-17.5 kg./mm.^{2} tensile strength. A corrosion resistant alloy of 12.6-14 kg./mm.^{2} runs as follows: 98.5 Mg, 1.5 Mn. A binary sand casting alloy of 88 Mg and 12 Al shows 13.3 kg./mm.^{2} in as cast state, but can be improved to 21.7 kg./mm.^{2} by suitable heat-treatment and to 31.5 kg./mm.^{2} by pressing. Rolled sheets of this alloy run as high as 37.1 kg./mm.^{2}. EF (2)

Satco. A New and Improved Bearing Metal. *Dutch Boy Quarterly,* Vol. 10, No. 2, 1932, pages 9-10. "Satco" is being successfully used in railway work as a lining for truck and trailer brasses, car journal bearings, lateral plates for engine trucks, trailer and driving boxes, cross-head gibs, etc., internal combustion engine bearings. Said to be useful under difficult service conditions due to its great resistance to crushing stress, low friction coefficient, relatively high melting point and softening point, besides ease in casting. Laboratory tests show:

Material:	Transverse strength lbs./in.^{2}	°of bend to failure
Satco Metal	24,285	11.0
R. R. Genuine Babbitt	23,770	7.0

Further tables show Brinell hardness up to 150° C. and reduction in height of specimens in comparison with the "Heavy Pressure Metal" and "Phoenix Metal." EF (2)

Wrought Gold Wire Alloys: Physical Properties and a Specification. GEORGE C. PAFFENBARGER, WILLIAM T. SWEENEY & AARON ISAACS. *Journal American Dental Association,* Vol. 19, Dec. 1932, pages 2061-2086. Work is confined to wrought wires which are used in prosthesis for clasps, bars, tongs, etc., and to those used in orthodontia, and is a report of work done at the Bureau of Standards in coöperation with American Dental Association. 18 samples of commercial Au wires were received from 9 manufacturers. The compositions of these alloys are shown in Table I.

TABLE I. COMPOSITION OF DENTAL WROUGHT GOLD ALLOYS*.
(Percent by Weight)

Alloy No.	Au	Ag	Cu	Pt	Pd	Ni	Zn
A	57.6	4.3	11.7	17.2	8.9	.....	0.10
B	64.3	5.2	10.5	16.7	2.2	.....	1.00
C	58.9	7.0	13.3	16.5	4.4	.....	0.05
D	54.5	6.2	13.0	17.7	7.2	.....	1.20
E	60.0	7.8	12.8	18.0	1.5	.....	0.06
F	54.6	7.1	12.3	17.2	7.3	.....	1.50
G	66.2	11.1	9.0	10.5	1.9	.....	1.00
H	58.8	8.5	12.9	17.3	2.6	.....	.....
I	54.3	7.9	12.5	17.0	7.1	.....	1.20
J	58.3	7.5	14.1	16.2	3.8	.....	0.06
K	60.4	15.2	9.0	15.5	.....	.....	.....
L	68.1	10.2	13.9	5.0	2.8	.....	.....
M	54.9	14.3	10.1	14.8	5.2	0.04	0.74
N	63.1	9.1	13.5	6.9	4.9	2.0	0.53
O	74.8	.....	1.9	.....	.....	18.4	4.30
P	63.2	14.9	11.3	10.6	.....	.....	.....
Q	61.9	13.0	12.5	7.9	3.9	.....	0.70
R	63.2	12.4	14.9	4.3	4.5	.....	0.60

*Alloy No. 0 is a white Au and contained 0.4% Mn. The physical properties determined were hardness (Vickers-Brinell), ultimate tensile strength, elastic limit, and elongation. These tests were made on specimens quenched from 700° C. and as quenched and reheated to 450° C. and slowly cooled to 250° C. "oven cooled." Effects of other heat treatments were also studied. Ultimate tensile strengths of quenched alloys ranged from 86,500 to 128,500 lbs./in.^{2} and of the "oven cooled" alloys from 118,000 to 184,000 lbs./in.^{2} Fusion temperatures were determined by "wire method." It was found that Vickers hardness number divided by 2 gave ultimate tensile strength in 1,000 lbs./in.^{2} There was also found a good relation between elastic limit and hardness, but, as was expected, there was poor correlation between hardness and elongation. All of alloys responded to heat treatment; that is, they showed higher hardness and strength on reheating to 450° C. and cooling slowly after quenching from 700° C. than they did as quenched. Amount of increase in strength ranged from 12 to 65% and could not be predicted from analysis. Of 18 alloys tested, 8 representing 7 manufacturers passed A.D.A. Tentative Specification No. 7, which is given. Parts of specification for minimum values are: Au and Pt group metals 75%, fusion temperature 1750° F., ultimate tensile strength "oven cooled" 150,000 lbs./in.^{2}, yield point "oven cooled" 125,000 lbs./in.^{2}, elongation-%/2 in. "as quenched" 15, as "oven cooled" 4. 9 references. OEH (2)

Copper and Copper Alloys, Cast and Wrought. Report of A.S.T.M. Committee B-5, C. H. MATHEWSON, Chairman. *Preprint* No. 22, June 1932, *American Society for Testing Materials,* 14 pages. Recommended revisions affecting standards and tentative standards. A new tentative specification for Cu water tube. VVK (2)

Transference Number of Gold in Gold Amalgams. (Die Überführungszahl des Goldes in Goldamalgam.) K. SCHWARZ. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 161, Aug. 1932, pages 231-232. In a 0.1% solution of Au in Hg, Au migrates to cathode. At 25° C., 2.8 $\times$ 10^{-9} g. atoms of Hg are transported to cathode by 96,500 Coulombs. EF (2)

A Study of Silumin containing Copper. NAMIO KAWASHIMA. *Suiyokai-Shi,* Vol. 6, 1931, pages 585-592. Cu up to 4% was added to Al-Si alloys containing 13 and 10% Si and cast in a metal mold and green sand mold. With these specimens tensile strength, elongation, hardness, density, corrosion in 3% NaCl solution and age-hardening were studied. Density of specimens cast in metal mold are increased by 0.014/1% Cu added, while that of sand mold, increased by 0.013. Pin holes tend to be formed readily as Cu content increases. Hardness and tensile strength increase and elongation markedly decreases, with increasing Cu content. Corrosion in 3% NaCl solution decreases as Cu content increases. When these alloys were quenched in water from 500° or 550° C., age-hardening is not marked at room temperature, but on heating to 100° to 150° C., those containing more than 2% Cu are markedly hardened and mechanical properties, i.e. tensile strength and elongation, are improved. Eutectic Si grain in microstructure of these cast alloys becomes coarser, as Cu content increases. On quenching, Si grains become much coarser, growth being marked as quenching temperature rises. TM (2)

Light Metals and Alloys, Cast and Wrought. Report of A.S.T.M. Committee B-7, J. B. JOHNSON, Chairman. *Preprint* No. 24, June 1932, *American Society for Testing Materials,* 10 pages. Progress reports of subcommittees. Proposed tentative specifications for Al alloy rods, wire and bars; Mg-base alloy sheet; and Mg-base alloy wrought shapes. VVK (2)

Aluminum Bronze in the Foundry. WESLEY LAMBERT. *Metal Industry,* London, Vol. 41, Aug. 26, 1932, pages 195-196; Sept. 2, 1932, pages 221-223. Reviews metallurgical properties. Usual composition is Cu 87-90%, Al 7-10.5%, Fe 1-4%, Sn 0.2-0.5%, other elements up to 1%. Tensile strength about 65,000 lbs./in.^{2}, elongation 15-20%, heat treated 4%, permanent-set stress 25,000 lbs./in.^{2}, heat treated 50,000 lbs. Melting and alloying procedure and foundry manipulation are discussed and preparation of samples for testing described. Ha (2)

Tin Bronzes with High Lead Content as Modern Bearing Materials in the Construction of Automobiles. (Zinnbronzen mit hohem Bleigehalt als neuzeitliche Lagerwerkstoffe im Automobilbau.) H. BLUME. *Automobiltechnische Zeitschrift,* Vol. 35, Aug. 25, 1932, pages 398-399. Very good bearing bronzes are now made with Pb contents up to 30 or 50% whereby Pb replaces Cu; these alloys are particularly satisfactory for high speed. Pb improves castability, densifies structure and makes working of material (by hammering or filing) easier. Tensile strength and elongation are influenced but are less sensitive at higher temperatures. In alloys of more than 0.7% Pb, Pb begins to segregate. As practical rule for melting and casting is stated that Pb-containing Sn bronzes must be heated to 1100°-1200° C., thoroughly mixed at this temperature, and cast at least at 1000° C. so that the homogeneous solution of the 3 metals which exists above 1050° C. is also maintained in casting. Green sand is preferably used for molds. Segregation of Pb can be restricted by addition of Ni, for instance by using an alloy of 5% Sn, 30% Pb, 1% Ni, 64% Cu. Ha (2)

Properties of Monel Metal and Similar Copper Nickel Alloys. (Die Eigenschaften von Monel-Metall und ähnlichen Kupfer-Nickellegierungen.) O. BAUER, J. WEERTS & O. VOLLENBRUCK. *Metallwirtschaft,* Vol. 11, Nov. 18, 1932, pages 629-633; Nov. 25, 1932, pages 643-649. Sample of natural Monel metal sheet and 2 samples of synthetic Nicorros alloy of almost identical chemical composition were tested. Principal difference was in C content. Monel metal, M I, contained .13% combined C Nicorros, N II, .12% combined and .20% graphitic C, and Nicorros, N III, .11% combined C. Microstructure of all 3 alloys consisted of Cu-Ni solid solution crystals, and N II also contained some graphite flakes. After same heat treatment the 3 alloys had equal tensile properties when tested in rolling direction, but transverse to rolling direction N II had lower elongation and reduction of area than M I and N III. Impact strength of N II, both with and across rolling direction, was much lower than M I and N III, apparently due to graphite inclusions. Hardness of N II in annealed, quenched, and quenched and drawn states, was higher. This is probably due to some of graphite going into solution at higher temperatures and forming more combined C. N II had lower specific gravity. M I and N III could be cold rolled up to capacity of available equipment, 94% reduction, but in N II cracks and seams formed. After annealing M I and N III could be cold rolled up to 96.5% reduction while N II cracked at 86% reduction. Wires drawn from M I and N III were free from defects when examined by X-rays. N II wires showed internal cracks across rolling direction after 62% reduction and with rolling direction after 78% reduction. Graphite flakes interrupt continuity of grains in cold worked metal. No cracks were found in cold drawn N II which was annealed in a vacuum before drawing. N II wire had more variable and on the average lower tensile strength than M I and N III and hardly any reduction of area. N II was also attacked by acids and salt solutions more than M I and N III. Conclusion was that if Cu and Ni can be melted together without enough C to form graphite physical properties will be equal to those of Monel metal obtained from its ore. CEM (2)

Non-Ferrous Metals. (Nichteisenmetalle.) H. CHRISTEN. *Schweizerische Technische Zeitschrift,* Vol. 29, Dec. 1, 1932, pages 725-732. Properties of a large number of non-ferrous alloys belonging to group of heavy metals are discussed, constructive rules and applications are given (1) Special brasses: Aeterna V.L.22, typical composition: 58.49% Cu, 36.59% Zn, 2.25% Mn, 1.97% Al, .43% Ni, .22% Fe, .03% Pb, has high tensile strength and elongation, good running properties. δ metal contains 55-60% Cu, 5-8% improving constituents (Mn, Fe, Al, Ni), balance Zn. Durana metal contains 65% Cu, 30% Zn, plus Fe. Rübel (Admos) alloy, an alloy of high corrosion stability, contains 54% Cu, 5% Ni, 2% Mn, 1% Fe, 1% Al, plus Zn. A similar alloy, W 1, (53.72% Cu, 37.51% Zn, 2.01% Mn, 5.23% Ni, 1.5% Fe, .03% P) is used for high pressure steam valves and ship screws since it is resistant to sea water. (2) Special bronzes: Casting bronze D.G. with 87% Cu, 4.5-10% Sn, 1-5% Ni, 1-5% Zn. Eutectoid bearing bronze (62% Cu, 30% Zn, 4% Sn, 2.5% Pb, 1.5% Ni) has better running properties than common Sn bronzes and is 30% cheaper. Poro bronze is a special Cu-Sn-Pb alloy with very fine grain. Aeterna W F 26 contains 82% Cu, 10% Al, 4.5% Fe, 3% Ni and traces of Pb and Mn. Be-bronzes contain Cu plus 1.5-4% Be. (3) Ni-Cu alloys: Admiro alloy No. 1 and 5 Typical analysis: 41.45% Cu, 40.75% Zn, 15.23% Ni, 1.35% Fe, 1.22% Mn. (4) Hard cutting metals, cast metals, as Stellite, Akrit, Celsit, Miramant, Wallramit sintered metals, as Widia, Carboloy, Titanit. Selected bibliography. GN (2)

Copper-Nickel used in Railroads. (Les Cupro-Nickels utilizes dans les Chemins de Fer.) M. GALIBOURG. *Cuivre et Laiton,* Vol. 5, Dec. 30, 1932, pages 581-582. Following alloys are given as preferably used in French railroad parts: (1) bronze B5, 62-59% Cu, 20-16% Zn, 18-16% Ni for car fittings, window frames, etc. (2) Cupro-nickel of 88% minimum Cu and 11% minimum Ni. (3) Cupro-manganese with at least 4% Mn is particularly resistant to corrosion and has following mechanical properties compared with foregoing:

Copper	23 kg./mm.^{2} ultimate strength, 30% elongation
Cupro-nickel	29 kg./mm.^{2} ultimate strength, 45% elongation
Cupro-manganese	33 kg./mm.^{2} ultimate strength, 34% elongation

Other special Ni-Cu alloys with Pb, Al, and Monel metal are briefly discussed. Ha (2)

What is Phosphor Bronze? (Was ist Phosphorbronze?) D. BR. SCHULZ. *Metallwirtschaft,* Vol. 11, Nov. 18, 1932, pages 634-635. Phosphor bronze has variously been described as (1) a Sn bronze which has been deoxidized with P but does not retain any P, (2) a Sn bronze which has been deoxidized with an excess of P and retains some P, and (3) a Cu-Sn alloy which contains P as an alloying element. It is suggested that P bronze be defined as a bronze containing from .1 to .3% P. CEM (2)

PROPERTIES OF FERROUS ALLOYS (3)

Representative Properties of Cast Medium Pearlitic Steels. FRED GROTTS. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 197-212. Includes discussion. Considerable data is given on the physical properties of the cast medium pearlitic steels such as .40-.50% C and .30-.40% C with small amounts of Mo, V, Cr, Ni, Cr-Ni, and Cr-Mo. New types of steels recently developed contain .30-.40% C with the following ranges of Mn: .50-.85%; 1.05-1.35%; 1.40-1.55%; 1.75-2.00% and 2.00-3.00%. To obtain the best results from steels having a Mn content above 1.50%, special treatments should be given to avoid temper brittleness. Steels can have many good physical properties while deficient in shock resistance, which seems to be a function of grain refinement. Special heat treatment or the addition of another element may provide good impact values. The author believes that much benefit would be derived by standardization, which can be facilitated by specifications. VVK (3)

Austenitic Manganese Steel Castings. JOHN HOWE HALL. *Proceedings American Society for Testing Materials,* Vol. 32, Part 2, 1932, pages 238-252. As usually produced, the composition of austenitic Mn steels lies within the following limits: C 1-1.4%, Mn 10-14%, Si 0.3-1.0%, S 0.04% max., P 0.10% max. It is made either in the basic electric furnace or by mixing in a ladle 80% ferro-manganese and low-carbon steel from an open-hearth furnace or a Bessemer converter (bottom blown or side blown). No difference could be found in the quality of the steel as produced by any of the commercial processes. To prevent brittleness due to separation of cementite, it should be heated to 1040°-1060° C. and quenched in cold water. Reheating castings for a long time at any temperature over 350° C. or for a short time at or over 400° C. liberates cementite and renders the steel very brittle. The electrical resistance is 71 microhms/cm.^{3}, the average thermal conductivity between 0° and 100° C. is 0.027 c.g.s. units and the mean coefficient of expansion between 0° and 100° C. is 0.000018/1° C. It is non-magnetic. Commercially unmachinable, test specimens must be ground to size. Tensile properties are very dependent on grain size which is in turn dependent on pouring temperature. The average tensile strength is around 118,800 with a proportional limit of 42,900 lbs./in.^{2} The Brinell hardness of the cast material is slightly over 200. Only by prolonged annealing around 500° C. can the hardness be increased to over 500 Brinell. In castings severe pounding and pressure which considerably distort the working surfaces will produce a hardness of 500 Brinell. Castings are subject to distortion when exposed to the cold working effect. The fatigue limit of the cast steel is 39,000 lbs./in.^{2} Welding is difficult but the use of Mn steel rods containing 3-5% Ni has been quite successful. VVK (3)

Hardening Cast Iron. J. E. HURST. *Iron & Steel Industry & British Foundryman,* Vol. 5, Aug. 1932, pages 389-391; *Foundry Trade Journal,* Vol. 47, July 21, 1932, pages 37-41; July 28, 1932, pages 54-55. Condensed from paper read before Institute of British Foundrymen, June 8. By suitable heat-treatment cast Fe of suitable composition can be hardened and its strength properties improved. Lowest quenching temperatures tend toward best results. Property of Ni to confer depth penetration of hardening was demonstrated in a series of bars 1¾, 4 and 5½ in. diam. each containing 1, 2, 3 and 4% Ni. About 2% Ni causes a substantial depth penetration. Special cast irons alloyed with Al and Cr are nitrided by heating in NH_3 at approximately 500° C. While best results were obtained on castings machined and ground, quite satisfactory results were obtained on unmachined castings. Maximum wear of engine cylinder liners of this material was 0.001" for 20,000 miles service. OWE + CHL (3)

Nimol, a New High Alloy Cast Iron. EDWIN WALKER. *Sands, Clays & Minerals,* Vol. 1, Sept. 1932, pages 45-50. Nimol is a cast Fe heavily alloyed with Ni, Cu and Cr (exact composition not given); it is substantially resistant to corrosion and chemical attack up to about 820° C. When corroded it takes on a rust film which forms at a slow and uniform rate. Scale adheres and prevents further corrosion of inner material. Is practically free from growth at high temperatures. Brinell hardness can be varied from 100 to 240 and can be increased to about 440 by chilling. Expansion coefficient up to 600° C. is 0.000018, about 50% greater than cast Fe and about same as bronze; sp.g. is 7.6; it is non-magnetic; electrical resistance is about 1.25% that of Cu. It can be welded with electric arc or by acetylene with welding rods of same composition and makes a soft and machinable weld. Patterns can be made in same way as for cast Fe. In England and Canada Nimol has been used widely in chemical industries, glass and ceramic industries and for pumps for salt solutions and in dock and harbor works. Ha (3)

An Improved Nickel-Chromium Hardened Chilled Cast Iron. J. S. VANICK. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 33, Feb. 1933, 13 pages; abstract, *Foundry Trade Journal,* Vol. 48, Apr. 27, 1933, pages 301-304. A discussion of the properties and uses of Ni-Cr iron, which includes many data obtained on carefully controlled heats. Ni tends to decrease the depth of chill but this can be rectified by addition of Cr. Excellent irons are made by adding 4 to 6% Ni and 1 to 2.5% Cr. These additions greatly increase the hardness, strength, and wear resistance of the case and increase the strength and hardness of the core. In an unalloyed iron containing 3.3 to 3.5% C, 0.75 to 0.90% Si the Brinell hardness of the chilled case is approximately 500 and the tensile strength of the core is between 16,000 and 25,005 lbs./in.^{2}. When 4.5% Ni and 1.5% Cr are added the Brinell hardness of the case is between 650 and 750 and the tensile strength of the core is between 30,000 and 35,000 lbs./in.^{2}. Similar improvements are effected in a low-carbon iron. The Ni-Cr irons are particularly suitable for rolls, mining equipment, and other parts subject to wear. Effects of Mn, S and Mo in the Ni-Cr irons are discussed. Mn is inclined to embrittle. Mo is generally beneficial. S increases strength. Microstructures indicate that the Ni and Cr tend to harden by converting the pearlite to sorbite, troostite or martensite. Useful irons can be made by adding smaller amounts of Ni and Cr, but they do not give as hard a case. OWE + JLG (3)

Nickel-Chromium-Silicon Cast Irons. A. L. NORBURY & E. MORGAN. *Iron & Steel of Canada,* Vol. 16, Jan. 1933, pages 9-12; *Mechanical World & Engineering Record,* Vol. 42, Sept. 23, 1932, page 290. Paper read before the Sept. 1932 meeting of the Iron & Steel Institute. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 99. Kz + OWE (3)

New Practice in Making High-Test Iron Castings. H. H. JUDSON. *Iron Age,* Vol. 130, July 21, 1932, pages 103-104, adv. sec. page 20. Abstract of paper read before the American Foundrymen's Association. See "High-Test Iron for Pressure Castings," *Metals & Alloys,* Vol. 4, May 1933, page MA 134. VSP (3)

Some Fundamental Characteristics of Stainless Steels. EDGAR C. BAIN. *Journal Society of Chemical Industry,* Vol. 51, Aug. 5, 1932, pages 662-667; Aug. 12, 1932, pages 683-690. Very comprehensive survey of Cr and Cr-Ni alloys including film-forming ability, C effect, metallography and properties at high temperatures. The austenitic alloys are particularly discussed from the standpoint of metallography, effect of cold working, carbide effect, and intergranular corrosion. VVK (3)

Steel Casting Progress Makes for Dependability. F. WALTER BLACKELY. *Machinery,* Vol. 38, Apr. 1932, pages 601-603. General discussion of improvements in steel castings. Carbon steel castings with not over 0.35% C are readily machinable, tensile strength 70,000-87,000 lbs./in.^{2}, yield point 40,000 to 55,000 lbs./in.^{2}, elongation in 2 in. 20-25%, reduction of area 30-45%. Brinell hardness 130-180. Alloys and special heat treatments give tensile strength up to 200,000 lbs./in.^{2}, yield point 150,000 lbs./in.^{2}, Brinell hardness 300-500. RHP (3)

Resilience of High-Grade Steels. (Resilience des Aciers de haute qualite.) BOETTCHER & FINK. *L'Usine,* Vol. 41, July 29, 1932, pages 27-29. Resilience of steels as a function of aging and annealing is discussed on basis of experiments and tables showing behavior of 5 different steels are reproduced. Ha (3)

A New Special Steel "Le Provinox" (Un nouvel acier special "Le Provinox"). *L'Usine,* Vol. 41, Nov. 11, 1932, page 9. Brief description of a new semi-non-oxidizing steel, composition not given, of 35-40 kg./mm.^{2} tensile strength, 70-80% of this value for elastic limit, 30%, even up to 36% elongation; good machinability both cold and hot. Ha (3)

Nicrosilal Castings. *Mechanical World & Engineering Record,* Vol. 43, Jan. 27, 1933, page 81. Nicrosilal recently developed by the British Cast Iron Research Association represents a heat-resisting austenitic cast Fe, easily machinable and yielding smooth surfaces. It contains about 18% Ni, 6% Si, 2% Cr. 1.8% total C, and 1% Mn. The cast Fe is resistant to growth and scaling, remarkably ductile; and not liable to cracking on sudden heating and cooling. It can be burnished and surface-hardened by cold work. Nicrosilal is non-magnetic, and has an electrical resistivity of about 160 microhms/cm.^{3} Kz (3)

High Pressure Gas Cylinders. (Gascylinders voor hoogen druk.) *Polytechnisch Weekblad,* Vol. 26, Dec. 29, 1932, page 824. The evolution of special steels for pressure vessels is traced and 2 recent analyses given as follows:

	C	Si	Mn	S	P	Ni	Cr	Mo
A	.310	.160	.49	.050	.031	2.62	0.71	0.38
B	.280	.190	.49	.032	.030	3.32	1.12	0.47

Cylinder wall must withstand a service pressure of 4000 kg./cm.^{2}; tensile strength = 9100-9700 kg./cm.^{2}, elongation = 20%. Heat treatment for A: 80 min. at 850°C., 90 min. at 600°C., and for B: 90 min. at 820° and 650°C. WH (3)

Acid Resisting Cast Steel A. P. S-6. (L'Acier Moule A. P. S-6 Resistant aux Acides.) *Revue de Fonderie Moderne,* Vol. 26, Oct. 10, 1932, pages 386-388. Cu steel the analysis of which is not given, for use in chemical engineering on account of its high acid-resisting qualities is discussed. Castings must be heat-treated either by simple annealing to 950°C., or still better by annealing twice, the first time to 1000°C. followed by quenching in water, then reheating to 950°C. and slowly cooling to about 700°C. with following water quench which produces a high corrosive resistance. A. P. S-6 has an ultimate strength of more than 42 kg./mm.^{2}, elongation of 20% and a resilience (Messnager) of 15 kg. A number of applications are given. Ha (3)

Testing Materials Society Reviews Steel Castings. *Steel,* Vol. 90, June 27, 1932, pages 28, 30, 32. **Committees Propose Many Revisions in Ferrous Metal Specifications.** *Steel,* Vol. 90, June 27, 1932, page 30. Reports of the papers delivered at the 35th annual meeting of the American Society for Testing Materials held in Atlantic City, June 20-24. JN (3)

Application and Production of Niresist, a New High Strength Cast Iron. (Niresist, ein neues hochwertiges Gusseisen- Verwendung und Herstellung.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Mar. 5, 1933, pages 95-96. Niresist contains 12-15% Ni, 5-7% Cu, 1.50-4% Cr, 1-1.50% Mn, 2.75-3.10% C, 1.25-2% Si, .04-.12% S and .04-.30% P and has the following special properties in comparison with common cast Fe: (1) remarkably high corrosion resistance, (2) high resistance to heat, (3) non-magnetizability (in dependence on composition), (4) high electric resistance and low temperature coefficient, (5) large thermal expansion. Ni and Cu are added by alloying Monel metal, Cr by ferrochrome. Melting of Niresist in the cupola, crucible or electric furnace is considered. The extensive field of application is given. GN (3)

Magnetic Irons. *Machinery,* London, Vol. 41, Feb. 2, 1933, pages 521-523. With growth of the light electrical and wireless industries increased use has been made of magnetic irons and steel for coil cores, armatures, pole pieces, and transformer laminations. To secure the best magnetic properties, magnetic iron should meet the following specified limits: C = 0.05 max; Mn = 0.05 max; Si = 0.05 max; S = 0.05 max; P = 0.03 max. The iron must be free from slag inclusions and should exhibit an almost pure ferrite structure. Even minimum machining operations lower the magnetic condition. Vickers hardness should not exceed VD/H 10 = 140. Magnetic iron should be annealed between 930° and 970°C. and cool off slowly. Critical temperature range in which working or bending of magnetic Fe is not advisable is 800°-1000°C. Composition of Invar having a low hysteresis loss and low coercive force is given as follows: C = 0.20 max; Mn = 1.15 max; Si = 0.15 max; S and P = 0.05 max; Ni = 35-37%. There are 4 brands of Si steels for laminations: grade I: 0.50-1.25% Si; II: 1.5-2.25% Si; III: 2.5-3.25% Si; and IV: 3.5-4.25% Si besides C = 0.20% max; Mn = 0.20% max; S and P = 0.05% max. Surface insulation may be obtained in the form of oxide coating, a pigmented coating, paper or insulating varnish. Properties of the different kinds of coatings are discussed. A table summarizes the mechanical properties of Si magnetic steels and a method for annealing treatment is given. High-Ni alloys as "Permalloy" or "Perminvar" are of great value when severe conditions have to be met. Kz (3)

Some Specifications Relating to Iron Castings. WALTER WEST. *Metallurgia,* Vol. 7, Apr. 1933, pages 197-200. Gives some British specifications for plain and alloy irons, and discusses influence of composition and structure on properties of gray Fe. JLG (3)

Manufacture, Properties, and Uses of 18-8 Chromium-Nickel Steel Wire. W. H. WILLS & J. K. FINDLEY. *Transactions American Society for Steel Treating,* Vol. 20, Aug. 1932, pages 97-114. Previously abstracted as Preprint No. 27, 1931. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 56. With discussion. WLC (3)

Properties of Low-carbon Medium-chromium Steels of the Air-hardening Type. E. C. WRIGHT & P. F. MUMMA. *American Institute of Mining & Metallurgical Engineers, Technical Publication* No. 496, Feb. 1933, 11 pages. The steels used consisted of 3 series containing respectively 0.1, 0.2 and 0.3% C. The Cr in each series was 1, 3, 5 and 7%. They were melted in 15-lb. lots in a high-frequency furnace, cast into 2" square ingots and forged to ⅝" rounds. No difficulty was encountered in forging any of them, though those containing 5 and 7% Cr were stiffer than ordinary structural steels. Brinell tests on air-cooled and tempered specimens indicated the proper temperatures for air quenching. Heating curves showed that the end of the A_c transformation was over 800°C. (823 to 869°C.) depending on the Cr content. Specimens were air cooled from 875 or 900°C. and tempered at temperatures between 550 and 800°C. One sample of each steel was furnace cooled. Tensile, Charpy impact and Izod impact values were reported. The tensile and impact values proved that steels containing 3 or 5% Cr had high strength together with good ductility when air cooled and tempered. The 1% Cr steels were little better than C steels, and little was gained by adding more than 5% Cr. The annealed steels had an elastic ratio of 0.50 or 0.55, while some of the air-cooled and tempered steels had a ratio of 0.75 or 0.80 together with high impact values. Accelerated corrosion tests indicated that from 3 to 5% Cr markedly increased corrosion resistance. JLG (3)

Wrought Iron, Fact and Opinion. JAMES J. CURRAN & E. A. SANFORD. *Metals & Alloys,* Vol. 4, Jan. 1933, pages 1-5. Points out that although wrought iron has been a fairly common material of construction for over 3000 years there is very little authoritative data from which sound specification for this material can be evolved. Methods of producing are discussed and fallibility of certain methods of detecting bad practice are shown. High Mn, pearlitic areas, combined crystalline and fibrous fracture are discussed and examples cited to indicate that they are not infallible criteria of added steel in piling. Inconsistencies of many claims are pointed out. Authors state that wrought iron has desirable properties but point out necessity for discard of old prejudices and fallacies and adoption of an aggressive and intelligent metallurgical attack of problem of cost. 9 references. WLC (3)

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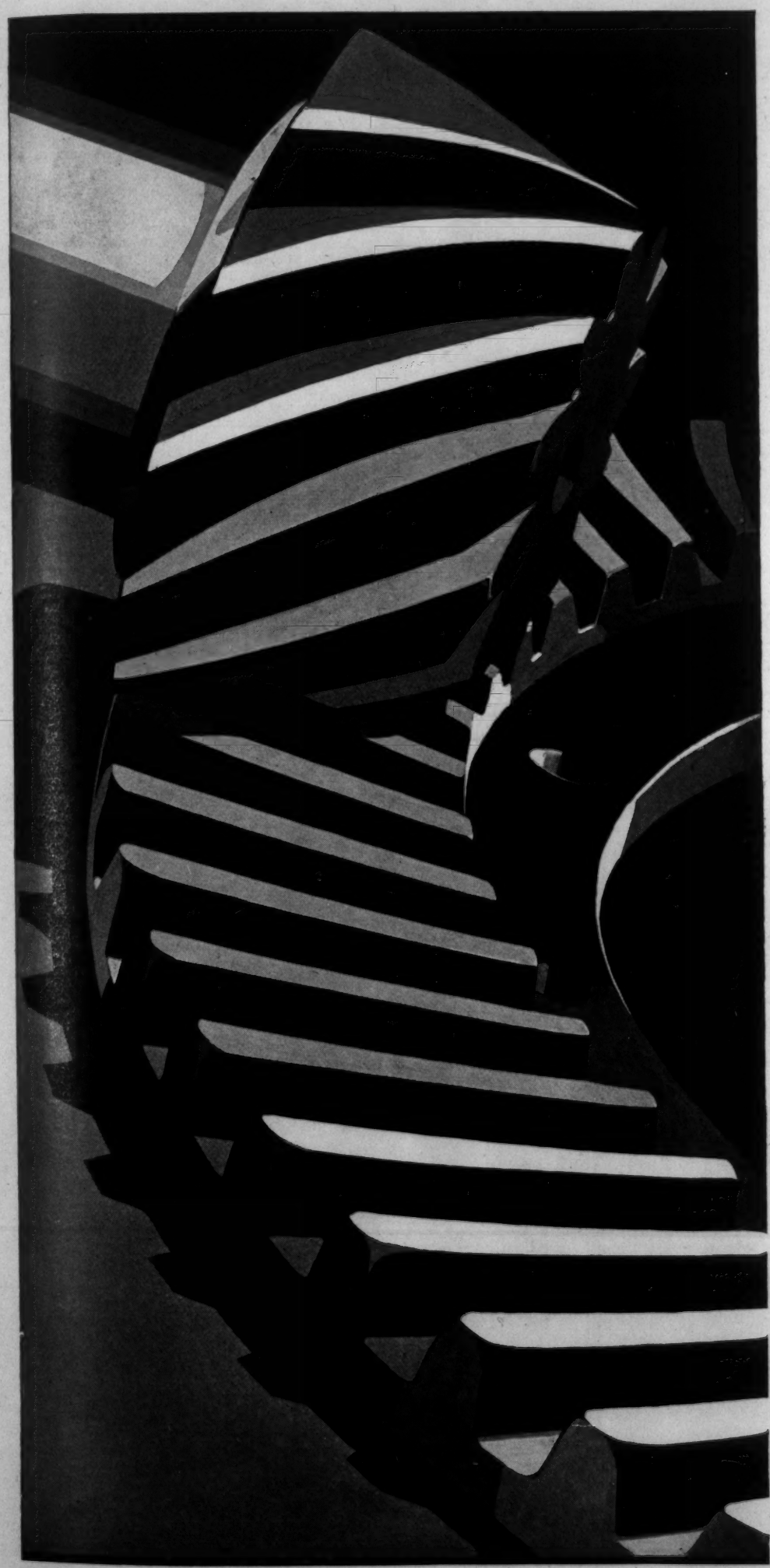

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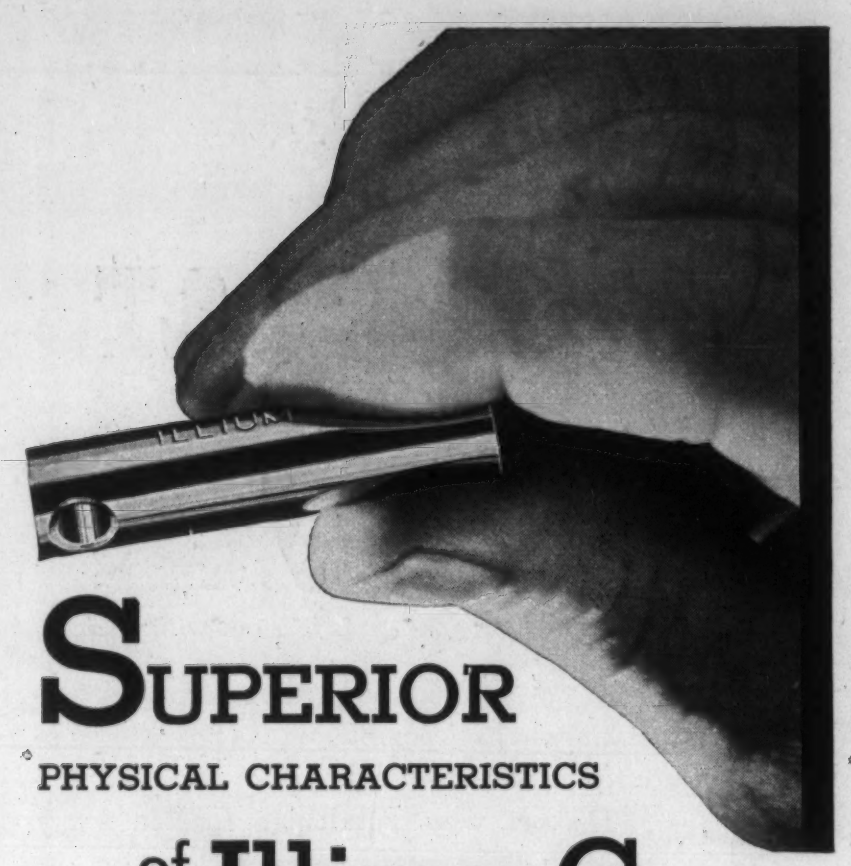

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CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION (4)

1 **Deterioration of Boiler Metal.** *Fuel Economist,* Vol. 8, Mar. 1933, pages 377-378; Apr. 1933, pages 451-452. Summary and discussion of recent work on boiler metal corrosion including that of McAdam, Hall and Straub. Corrosion by fatigue, sources of corrosion of boiler metal, and prevention of embrittlement are taken up separately. DTR (4)

Corrosion of Chemical Lead. P. F. THOMPSON. *Proceedings Australasian Institute Mining & Metallurgy,* No. 87, Sept. 30, 1932, pages 193-206. Potential measurements were made on specimens of Pb. Results, not conclusive, indicate that Fe segregated at various places may be an important factor in corrosion. AHE (4)

2 **Apparatus for Determination of Resistance of Alloys in Hot Corrosive Liquids. (Appareil pour la Détermination de la Résistance des Alliages aux Liquides Corrsifs Chauds.)** H. THYSSEN & J. BOURDOUXHE. *Revue Universelle des Mines,* Vol. 9, Feb. 15, 1933, pages 95-97. Describes a glass apparatus in which the corrosive liquid is both heated and kept in motion; the gases formed by the corrosion can be exhausted and analyzed. Ha (4)

3 **Contribution to Question of Solubility of Lead in Water. (Beitrag zur Frage der Löslichkeit des Bleies in Wasser.)** J. ZINK. *Zeitschrift für analytische Chemie,* Vol. 91, No. 7/8, 1933, pages 246-258. Literature dealing with this subject is reviewed and the conclusions discussed. The action of distilled H_2O, H_2O containing CO_2, chlorides, sulphates, nitrates and combined salt solutions was investigated and tabulated. It can be said that almost every water can dissolve Pb more or less according to the composition of the water. The deposit of Pb salts can protect the pipes against further corrosion by the water but as these salts are not entirely insoluble the corrosion will never be stopped entirely. This can be effectively done only by the deposition of indifferent, difficultly soluble salts. Ha (4)

4 **Rust Removing and Paint Coating Shop of Hafenbetriebsgesellschaft Wanne-Herne. (Entrostungs- und Streichanlage der Hafenbetriebsgesellschaft Wanne-Herne.)** WEHRSPAN. *Verkehrstechnik,* Vol. 49, Nov. 28, 1932, pages 633-635. Detailed description of sand blasting and painting installations intended to fight corrosion of transportation means due to attack of acid water from washed coal and coke. Cost sheet is included, which proves that erection of rather expensive maintenance shop is justified. WH (4)

5 **Corrosion in Recesses of Chemically Processed Components.** *Machinery,* London, Vol. 41, Oct. 13, 1932, pages 45-46. Methods in use and new ones involving hot mixture of paraffin wax in mobile mineral oil and hot paraffin oil are discussed to remove chemical remnants from recesses after dipping or plating processes. Kz (4)

Zinc-free Alloys for Condenser Tubes. *Marine Engineer & Motorship Builder,* Vol. 55, Mar. 1932, page 99. For condenser tubes low priced alloys containing Zn and higher-priced cupro-nickel and Al bronzes are in use. Since the presence of Zn is blamed for corrosion in the form of de-zincification there has been need for a Zn-free but low-priced alloy. "Broternal" is claimed to be highly corrosion resistant and approved for condenser tubes and telescopic periscope tubes. It is a ternary alloy containing Al. Ultimate tensile strength: over 40 tons/in.^{2}, elongation: over 20% in 2 in. "Broternal" condenser tubes are 10% lighter than cupro-nickel tubes and form a tenacious and self-healing film on the surface. Kz (4)

The "Agnes Seed" Boiler Explosion. *Marine Engineer & Motorship Builder,* Vol. 55, Oct. 1932, pages 335-339. Rupture of bottom plate of boiler was due to extensive grooving caused by corrosion. Kz (4)

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Corrosion of Piping at Sea. *Marine Engineer & Shipping Age,* Vol. 37, Nov. 1932, page 474. Experiments aboard steamships showed severe pitting after a short time of Cu piping in the sanitary and salt water circulating system. Investigations proved that defects were not due to stray electric currents or electrolytic action. Red brass pipes also pitted whereas wrought iron galvanized pipes gave good results. Kz (4)

Electrical Measurement of Corrosion. *Metallurgist,* Sept. 1932, pages 131-133. Review of various electrical methods of measuring corrosion. Results reported by various investigators are not in agreement and final conclusion is that very little can be expected from stimulated electrical methods of measuring corrosion. VVK (4)

Blackening of Aluminum. *Metal Industry,* London, Vol. 41, Aug. 5, 1932, page 130. The so-called blackening of Al is due to a fine film of hydroxide formed on its surface and is perfectly harmless. It rather protects the underlying metal. Ha (4)

Corrosion Appearances on Ships. (Corrosieverschijnselen aan boord van schepen.) *Polytechnisch Weekblad,* Vol. 26, Jan. 21, 1932, pages 38-40; Feb. 4, 1932, pages 68-70. Occurrence of corrosion on the ship hull as well as in the pipe line systems is fully discussed. WH (4)

Copper Bearing Steel. (Koperstaal.) *Polytechnisch Weekblad,* Vol. 26, Feb. 11, 1932, pages 89-90. Experimental results of Unger, Storey, Daeves and Schultz on corrosion properties of Cu bearing steels are summarized. WH (4)

Apparatus for Detecting Corrosion and Fractures in Gas and Water Mains. (Physikalische Hilfsmittel zur Aufsuchung von Korrosionen und Brüchen an Gas- und Wasserleitungsröhren.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Feb. 19, 1933, page 106. Brief account of electrical measuring outfit of Ambronn Co., for detecting and studying corrosion on gas and water mains. GN (4)

Corrosion costs industry many thousands of dollars. Are you keeping up-to-date on this important subject?

Causes of Smoke Pipe Corrosion. *Sheet Metal Worker,* Vol. 23, Aug. 1932, pages 355-356. Reasons for greatly differing life of smoke pipes are discussed. Material should be selected according to character of flue gases and temperature. Mode and frequency of cleaning contributes materially to life of pipe. Ha (4)

Corrosion Problems in the Textile Industry. *Textile World,* Vol. 82, Aug. 1932, page 78. Use of rubber as parts, or of rubber-covered parts, in machinery of textile manufacture for overcoming losses due to corrosion of metal parts is discussed. Table shows chemical resistance of rubber compounds of various degrees of vulcanization against chemicals. Ha (4)

Slime and Mussel Control in Surface Condensers and Circulating Water Tunnels. Sheppard T. Powell. *Combustion,* Vol. 4, Apr. 1933, pages 7-13. Review of development in prevention of slime and mussel growths by heat, chemicals and electrolytic processes. Maintenance of clean condenser tube surfaces and intake circulating water tunnels is a problem of major importance in practically all steam generating stations where such equipment is used. Writer presents comprehensive discussion of current practice. Each method of treatment is outlined and its success indicated in so far as results, up to the present time permit. DTR (4)

The Corrosion Problem. Part IV. Nickel, Tin, Zinc and Its Alloys. (Zur Korrosionsfrage. IV. Nickel, Zinn, Zink und Legierungen.) E. Naumann. *Gas und Wasserfach,* Vol. 76, Mar. 4, 1933, pages 146-147. The mentioned metals are hardly used in pure state but as metallic coatings and alloys. After discussing the application of these metals and its alloys, their corrosion by chemical agents and their poisoning effect on the human body when contained in drinking water are considered. GN (4)

Cavitation Experiments on a Model Propeller. G. Kempf. *Engineer,* Vol. 153, Apr. 8, 1932, page 386; *Engineering,* Vol. 133, Apr. 1, 1932, pages 393, 410-411. Includes discussion. Condensed from paper read before Institution of Naval Architects, Mar. 17, 1932. Describes closed water tunnel built at Hamburg Experimental Tank to investigate problems of propeller cavitation arising from present tendency towards ships with higher speeds and increased powers. Original paper contains bibliography of available literature on cavitation in relation to screw propulsion. LFM (4)

Aluminum in Aluminum Alloys soluble in Hydrochloric Acid. (Salzsäurelösliches Aluminium in Aluminiumlegierungen.) Bergmann. *Aluminium,* Vol. 14, Oct. 15, 1932, pages 4-5. Methods are described in detail to determine that amount of Al in an Al alloy which alone is soluble in HCl. Ha (4)

Profile Measurements During Erosion. (Profilmessungen bei Kavitation.) O. Walchner. *Werft, Reederei und Hafen,* Vol. 13, Sept. 1, 1932, pages 251-252. Paper at the Konferenz über hydromechanische Probleme des Schiffsantriebs, Hamburg, 1932, deals with the testing method and results gained in the Göttinger Kaiser Wilhelm Institut für Strömungsforschung mainly with reference to the following problems: when does "cavitation" start and when are the accompanying phenomena corrosion and vibration to be expected. WH (4)

Effect of Alcoholic Motor Fuels upon Aluminum and Aluminum Alloys. (Über die Einwirkung von alkoholhaltigen Treibstoffen auf Aluminium und Aluminiumlegierungen.) O. Bauer & G. Schikorr. *Zeitschrift für Metallkunde,* Vol. 25, Feb. 1933, page 44; *Automobiltechnische Zeitschrift,* Vol. 35, Dec. 25, 1932, pages 583-589. Corrosive effect of motor fuels (gasoline, benzine) containing alcohol upon pure Al and 3 Al alloys was studied. It is shown that the weight loss is not increased by the addition to the motor fuel of anhydrous alcohol, but is considerably increased (three to tenfold) by the addition of 0.5% water and much further increased by further additions of water. The higher corrosion in commercial alcoholic motor fuels is thus caused by the water present. RFM + Ha (4)

Study on the Corrosion of Gray Cast Iron by Nitric Acid. The Exothermic Phenomenon of Gray Cast Iron Piece in Nitric Acid Solution and at Its Surface in Atmosphere after Corrosion by Nitric Acid. Y. Yamamoto. *Institute of Physical & Chemical Research,* Tokyo, Supplement to Scientific Papers, Vol. 19, Oct. 1, 1932, 11 pages. Actual corrosion loss in HNO_3 in relation to exothermal phenomenon of gray cast Fe containing 3.17% C (graphite), 3.63% total C, 1.25% Si, 0.79% Mn, 0.584% P, 0.043% S, 0.26% Cu, in HNO_3-solution was studied and results are presented in 31 diagrams, which show temperature of sample and solution (and room) in dependence on time and HNO_3-concentration. Latter varied between 3.5 and 49% and yielded 3 groups of concentration ranges, i.e. 0-17%, 17-29%, and above 29%. In last range, test pieces are coated with an insoluble oxide film which interrupts corrosion attack. Actual weight loss curve also proves that gray cast Fe becomes passive, since oxidizing power of HNO_3 surpasses solubility above 29%. WH (4)

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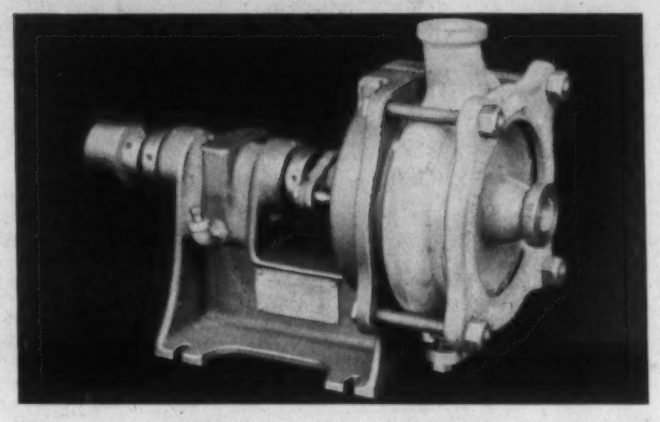

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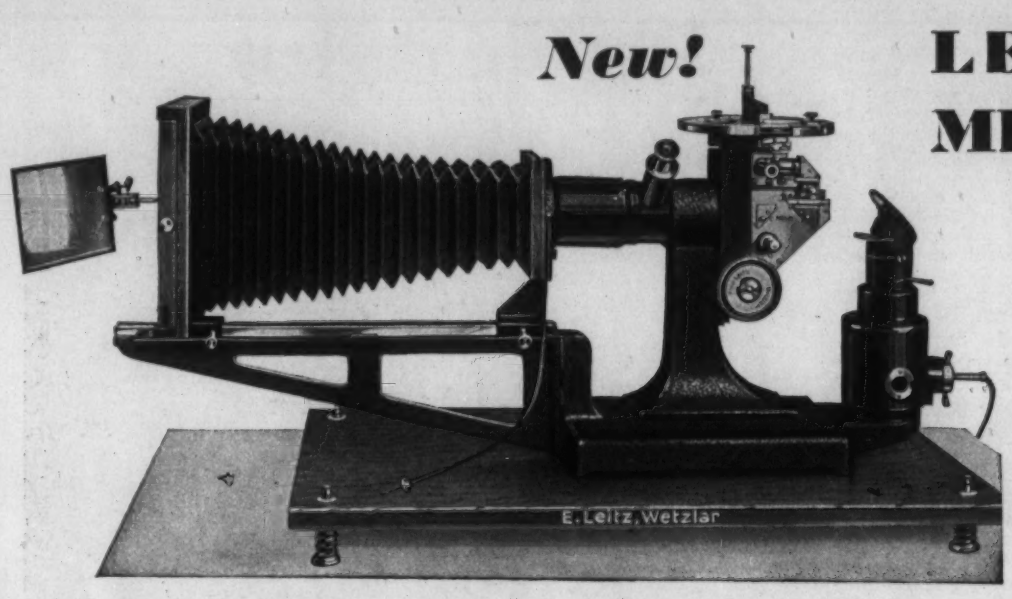

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STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Influence of Special Elements on the Carbon Content of the Iron-Carbon Eutectoid. EVERETT L. REED. *Transactions American Society for Steel Treating*, Vol. 20, Aug. 1932, pages 115-176. Previously abstracted as Preprint No 32, 1931. See *Metals & Alloys*, Vol. 3, Feb. 1932, page MA 34. With discussion. WLC (5a)

Factors Affecting the Inherent Hardenability of Steel. EDGAR C. BAIN. *Metal Progress*, Vol. 22, Nov. 1932, pages 17-21, 68. Abstract of Campbell Memorial Lecture 1932. Effects of cooling velocity, grain size and oxygen on the hardenability of steel are discussed. Dr. Bain's experiments show that coarse grained steel transforms more slowly and hardens better and deeper. The effect of alloying elements toward deep and shallow hardening is mentioned. Oxygen as it is dissolved lowers the true critical point, Al_e, and at the same time provides the high reaction rate and high carbon diffusivity responsible for abnormality. But oxygen alone is not a vital factor in shallow hardening. Hardenability in steel depends mostly on the actual rate of transformation of austenite to pearlite, and this rate depends on its composition and effective grain size. WLC (5a)

Steel in the Light of the Precipitation Theory. ALBERT SAUVEUR. *Metals & Alloys*, Vol. 3, Dec. 1932, pages 263-269, 280. Discusses aspects of diamond theory of hardening of steel and necessity for intermediate products between austenite and pearlite. WLC (5a)

Recent Investigations on the Graphitic Nuclei Formation in Cast Iron. (Neuere Untersuchungen über Graphitkeimbildung in Gusseisen.) SCHEIL. *Die Giesserei*, Vol. 19, Nov. 25, 1932, page 478. Measurements by a new method for determining number of graphite nuclei in a metallographic section and their change due to different conditions during melting seems to lead to a modification of the hypothesis of Haneman that the molecular structure of liquid cast iron changes under overheating. This agrees with views of Piwowarsky according to which molecular changes in melt are responsible for influence of overheating on formation of graphite nuclei. Ha (5a)

Discontinuous Translation of Zinc Crystals. (Ueber Sprunghafte Translation von Zinkkristallen.) E. SCHMID & M. A. VALOUCH. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft 21, 1933, pages 60-64. If pure Zn crystals are stressed beyond elastic limit a discontinuous basis translation is observed which is particularly conspicuous in crystals with transverse initial position of the basis. This phenomenon is investigated more closely and the critical stresses determined as function of the degree of purity. Ha (5a)

Preparation of Lead and Lead Alloy Cable Sheath for Microscopic Examination. E. E. SCHUMACHER & G. M. BOUTON. *Metal Industry*, London, Vol. 42, Jan. 20, 1933, pages 101-103. Methods of preparing thin slices of Pb by microtome and etching of Pb and Pb-Sb, Pb-Ca and Pb-Sn alloys are described in detail. Ha (5a)

Thermomagnetic Phenomena in Steel. R. L. SANFORD & G. A. ELLINGER. *Transactions American Society for Steel Treating*, Vol. 20, Sept. 1932, pages 263-388. Previously abstracted as Preprint No. 32, 1931. See *Metals & Alloys*, Vol. 3, Feb. 1932, page MA 35. With discussion. WLC (5a)

The Measurement of Grain-Size. R. G. JOHNSTON. *Metal Industry*, London, Vol. 42, Feb. 3, 1933, pages 145-146. For purpose of sheet metal control, especially for deep drawing, the correlation between grain size and drawing properties is often used as an indication of suitability of sheet. Attention is called, however, to fact that neither size nor distribution can be determined exactly enough to make this method an absolutely reliable one; much more research remains still to be done in this field. Ha (5a)

Copper-silicon System. (Beitrag zur Kenntnis des Systems Kupfer-Silicium.) KARL SAUTNER. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 9, 1932, 31 pages. Alloys containing as much as 14% Si were studied by means of cooling curves, X-ray diffraction patterns, and microscopic examination with polarized light. Detailed results are not given, but a proposed diagram is completely described, which differs from those given by Matuyama, Smith and Arrhenius, and Westgren. The α phase extends to 5.2% Si at 700° C. and to 3.6% Si at room temperature. The β phase is formed by a peritectic reaction between melt and α at 830° C., and decomposes by a eutectoid reaction at 700° C. It has a hexagonal close-packed lattice with a = 2.40 A.U. and c/a = 1.633. Surprisingly, another phase (ζ) also forms at the horizontal at 830° C. It also has a close-packed hexagonal lattice of a = 2.58 A.U. and c/a = 1.63. It decomposes by a eutectoid reaction at 760° C. into $\beta + \gamma$. The γ phase, with about 8% Si, is stable at all temperatures below its melting point. The δ phase is formed at 810° C. by a peritectic reaction between γ and melt. It is decomposed by a eutectoid reaction at 710° C. into γ and η. The η phase, with about 12.8% Si is stable only at higher temperatures. It melts without decomposition. It decomposes to ϵ and Si at 580° C. The ϵ phase is formed by a peritectoid reaction between γ and η at 620° C. The suitability of polarized light for microscopic examination is stressed, and it is claimed that it has been used for the first time in studying equilibrium diagrams. 18 references. JLG (5a)

The Nature and Prevention of Intergranular Corrosion in Austenitic Stainless Steels. E. C. BAIN, R. H. ABORN & J. J. B. RUTHERFORD. *Transactions American Society for Steel Treating*, Vol. 21, June 1933, pages 481-509. Susceptibility of 18-8 austenitic steel to intergranular corrosion in the vicinity of 1000°-1500° F. and methods of prevention are discussed. C dissolved at high temperatures and permanently retained in supersaturated solution at ordinary temperature is rejected at intermediate temperatures in the grain boundaries as Cr-rich carbides, thus reducing the Cr below the concentration necessary for normal corrosion resistance. Ti or Co additions in sufficient concentration combine with the C in place of Cr and prevent Cr depletion. Experiments on 18-8 steel with various C contents are reported as to susceptibility to a $CuSO_4$-H_2SO_4 solution (without effect on ordinary unsensitized metal), in penetration as measured by electric resistance. The effect of heating for various periods below, through and above the sensitizing zone is shown graphically. For each period of heating there is a particular temperature which induces the severest susceptibility. Susceptibility increases with continued heating in the intermediate range, reaches a maximum, and with further heating, begins to lessen. At low temperatures this recovery may not begin in observable time, at higher temperatures in a few hours or less. The sensitization is proportional to C content without regard to Cr or Ni within the normal limits of the alloy. No sensitization occurs below 0.02% C. Coarse grained steel is sensitized quicker than fine grained. 18-8 alloys develop some ferrite and become magnetic with sensitization. The maximum magnetic induction does not coincide with maximum sensitivity and higher Ni alloys become sensitive without becoming magnetic. An intergranular precipitation of a carbide phase, shown by micrographs, typifies the sensitive metal. The corrosion cuts along the grain boundary affecting the adjacent grain severely. Plasticity is somewhat reduced with sensitization and hardness and strength increase. Cold worked metal is more rapidly sensitized, but not as severely as annealed, and is promptly restored with further heating. General precipitation on slip planes instead of grain boundaries is effected in this case. Presence of ferrite usually reduces sensitization. The mechanism of sensitization is described with diagrams. The prevention of intergranular corrosion may be effected by reducing C below 0.02%, which is impractical, restoring cold worked metal at 1380° F., and addition of Ti metal. The improvement of stabilized Ti-bearing 18-8 over regular 18-8 is shown by graphs. C content minus .02 times 6 equals the amount required. The Ti treated alloy must be heat treated before working. The mechanism of stabilization is discussed. 14 references. WLC (5a)

Structure & X-ray Analysis (5b)

Does the Change of Lattice Constants During the Formation of Solid Solutions Depend on Grain Size? (Hängt die Änderung der Gitterkonstanten bei Mischkristallbildung von der Korngrösse ab?) U. Dehlinger & P. Wiest. *Metallwirtschaft*, Vol. 12, Jan. 6, 1933, pages 2-3. Differences in lattice constants between single crystals and poly-crystalline materials, which were doubted by E. Schmid and G. Siebel, were again established on samples of Ag-Au alloys. Recently it was also found that the lattice constants are different for cast and recrystallized Ag-Au alloy samples. CEM (5b)

Testing of Welded Joints by X-Rays. (Versuche über die Verwendung von Röntgenstrahlen für die Prüfung von Schweissverbindungen.) K. Adloff. *Die Wärme*, Vol. 55, Sept. 10, 1932, page 634. Due to the long penetration times of X-rays, the investigation of welded joints of heavy steel sheets is commercially limited to a maximum thickness of 50 mm. EF (5b)

An Improved Laue Camera. H. Kersten & W. Lange. *Review of Scientific Instruments*, Vol. 3, Sept. 1932, pages 493-496. Describes camera in which a compensation is so arranged that the beams which strike near the main beam give the same blackening on the plate as those near the edge of the film. This is particularly useful if the distance from crystal to film is relatively small. Ha (5b)

A Study of Homogeneity Limits of Wüstite (FeO) By X-Ray Methods. E. R. Jette & F. Foote. *American Institute Mining & Metallurgical Engineers, Contribution* No. 7, Feb. 1933, 9 pages. Powdered samples in equilibrium at various temperatures with Fe or Fe_3O_4 were prepared and the lattice parameter obtained with a focussing camera. The point at which Wüstite decomposes in the Fe and Fe_3O_4 was at 76.4% Fe and between 565° and 570° C. The Wüstite field indicated by the work was in fair agreement with that shown by Pfeil. The field did not include the composition FeO. The highest Fe concentration of the phase was 76.75%, and the lowest 75.75%. 9 references. JLG (5b)

An X-ray Investigation of the Bismuth-Antimony Alloys. E. G. Bowen & Morris Jones. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Ser. 7, Vol. 13, May 1932, pages 1029-1032. Nine alloys having composition intervals of 10% were heated at 280° C. for 400 hours, allowed to cool gradually to room temperature over a period of 200 hours. Results of X-ray examination are given in a large table. The 2 constituents can be rendered homogeneous when kept at a temperature above melting point of Bi and cooled slowly. Change of lattice edge with composition is almost linear over the whole range of composition. RHP (5b)

Electronic Refraction on Pure and Passive Iron. (Über Elektronenbeugung an reinem und an passivem Eisen.) W. Boas & E. Rupp. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft 21, 1933, pages 79-83. By varying the angle of incidence on an Fe-crystal 13 refraction maxima of electrons were found; inner potential was determined to 14±1 volt. The test method is described. Ha (5b)

What the X-Ray Tells About Castings. Richard K. Akin. *Machinery*, Vol. 38, Apr. 1932, pages 593-594. Emphasizes importance and value of X-rays in detecting defects in large castings. Discussion, May 1932, page 693. RHP (5b)

Dimensioning Faults by X-Rays. *Mechanical World & Engineering Record*, Vol. 91, Apr. 29, 1932, page 415. An X-ray photograph projects faults into one flat plane, and gives no indication of the depth at which the fault lies. This depth can be found by taking a double exposure and making a calculation from known dimensions. Kz (5b)

X-Ray Testing of Metals. *Mechanical World & Engineering Record*, Vol. 42, Dec. 9, 1932, page 563. 3 X-ray analyses have been developed: (1) analysis by absorption, giving shadow pictures on a film or fluorescent screen; (2) analysis by interference or diffraction patterns; and (3) spectral analysis. Kz (5b)

Precise Determination of Lattice Constants by the Reflex-Ray Process. (Ueber die Präzionsbestimmung von Gitterkonstanten mit dem Rückstrahlverfahren.) F. Wever & H. Mueller. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 15, No. 6, 1933, pages 59-69. This method uses a very narrow monochromatic X-ray beam which hits the surface to be investigated vertically; the reflected rays are caught by a circular film arranged perpendicularly to the primary X-ray beam. A much greater accuracy can be obtained in the evaluation as the sine-functions for the angles of the reflected rays required for the latter change much slower in the investigated range than the angles themselves. It is, however, necessary to exactly determine the distance of sample from film. A series of tests are described; the average was $1/5 \times 10^{-6}$ under a reflex angle around 75°. 16 references. Ha (5b)

What the X-Ray Tells About Castings. *Machinery*, London, Vol. 40, May 26, 1932, pages 230-231. Invisible defects, detected by X-ray pictures are eliminated by changes in casting and melting practice after determination of the different causes resulting in defects. Kz (5b)

Relation Between Precipitation Process in Single Crystals and Polycrystalline Materials. (Über den Zusammenhang des Ausscheidungsvorganges bei Ein- und Vielkristallen.) P. Wiest. *Metallwirtschaft*, Vol. 12, Jan. 27, 1933, pages 47-48. X-ray photograms without rotating specimen were taken of polycrystalline 90% Cu, 10% Ag alloy which had been quenched from 780° C. and reheated for various lengths of time at 350°. These show that there are intermediate positions between initial and final lattices which indicate existence of transition lattice. It is probable that there is no fundamental difference between precipitation process in single crystals and polycrystalline materials. Difference consists only in speed of precipitation, which is considerably greater in polycrystalline materials than in single crystals. 6 references. CEM (5b)

Differences in Lattice Constants of Single Crystals and Polycrystalline Materials. (Bemerkung zur Frage der Unterschiede von Gitterkonstanten von Einkristallen und vielkristallinen Material.) P. Wiest. *Metallwirtschaft*, Vol. 12, May 5, 1933, page 255. Author's tests on Al-Cu alloy containing 5% Cu were not as extensive as those of Phillips and Brick, and the alloy was made from technical 98-99% Al instead of pure Al. As a result of further tests it is concluded that the lattice constants are not a function of grain size alone, but of degree of cold working, annealing temperature, and annealing time. 5 references. CEM (5b)

The Electrostatic Potential of Some Cubic Crystal Lattices. T. S. Wheeler. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 14, July 1932, pages 56-66. Discusses a simple method of calculating potentials of some cubic crystals. Method is based on calculation of potential of a simple cubic lattice with regard to central lattice point, and relating of potential of crystals considered to result of this calculation. From results the potentials of crystals comprising these lattices can be deduced. Discussion of this article appears in Nov. 1932, pages 745-746. Discussion is by J. Sherman. 9 references. RHP (5b)

Lattice Distortion and Carbide Formation in Tungsten Magnet Steels. W. A. Wood & C. Wainwright. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 14, July 1932, pages 191-198. X-ray study of relation between changes in carbide formation and state of crystal lattice produced by heat treatment of 6% W magnet steels, and of spoiling and recovery associated with these steels. W and C are ejected from parent lattice to form carbides and release lattice strain in spoils state. In normal and recovered states these elements are dissolved in lattice and produce distortion and hardness. W enters lattice by substituting Fe atoms, preserving body-centered cubic structure. Spacing decrease on spoiling shows that entire 6% W is removed from lattice. C atoms are mainly responsible for spoiling. 4 references. RHP (5b)

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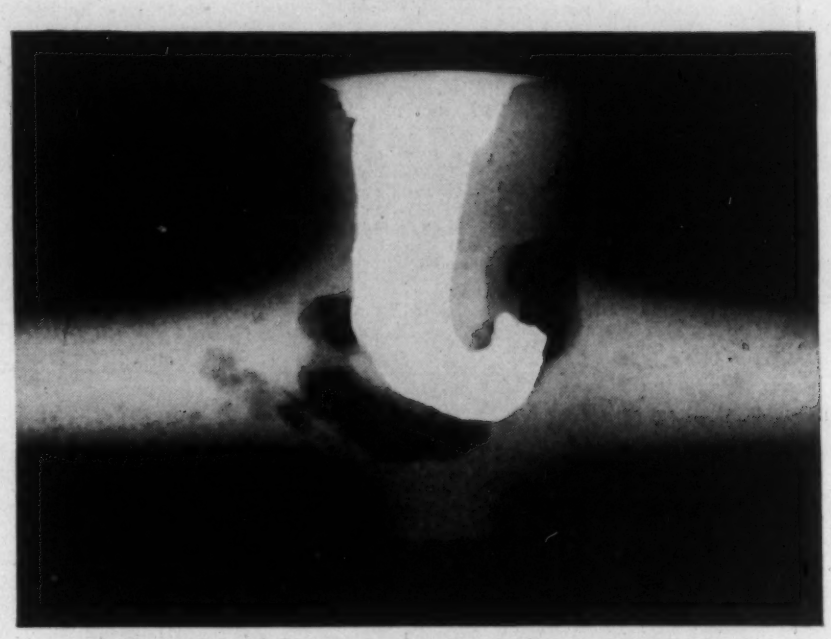

Radiograph of this casting revealed cavity in vicinity of gate, partially filled with metal after removal of gate.

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PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

The Growth of Cast Iron. (Untersuchungen über das Wachsen von Gusseisen.) ERICH SCHEIL. *Archiv für das Eisenhüttenwesen*, Vol. 6, Aug. 1932, pages 61-67. Report 185, Committee on Materials of Verein deutscher Eisenhüttenleute. In past reasons for growth of cast Fe were given as cementite decomposition, oxidation and cracks caused by tension stresses or occluded gases. 2 main problems were studied in this paper: (1) changes in structure on annealing below pearlite point, and (2) effect of size and shape of sample on growth. 4 brands of cast Fe were used, analyses are tabulated below.

Cast Iron	Total % C	% Graphite	% Si	% Mn	% P	% S
1	3.16	2.54	1.53	0.67	0.825	0.122
2	3.68	3.04	1.96	0.72	0.656	0.078
3	3.44	2.90	1.69	0.53	0.405	0.082
4	3.60	3.04	1.89	0.75	0.632	0.080

Writer makes certain definite conclusions; first of all, growth of cast iron is tied up with certain changes in structure. Breaking down of cementite around graphite layers occurs in those zones, into which gases on outside are no longer able to penetrate through graphite layers. In border zones, into which oxidizing gases penetrate along graphite veins, an oxidation takes place secondary to cementite decomposition. In this oxidation Si present in ferrite is converted into silicic acid or a silicate, which is very minutely distributed in ferrite nucleus. A new structure component is formed in ferrite along graphite layers, probably a mixture of ferrite and a silicate. Graphite layers are slowly gasified through the oxygen, oxides of Fe forming simultaneously, until no graphite exists. In event that graphite pieces are surrounded rather rapidly by an oxide layer, then decomposition of cementite is in turn largely arrested. Corresponding to structure observations amount of growth decreases with increasing cross-section of sample. On other hand, middle of large samples grow much more than outside, so that a swelling of boundary surface occurs. Change in volume during cementite decomposition was determined and found to check rather well with the calculated value of Benedicks. Results for changes in volume and length of cast Fe at 600° C. in air are given below.

				Volume Increase			True Volume Increase		
Cast Iron No.	Sample	Pore Space %	Specific volume cc./g.	Measured %	Calc. from increase in length %	Difference %	Measured cc./g.	Calc. from Cementite cc./g.	Difference %
	Original	0	0.13880	.....	.....	.....	.....	.....	.....
1	Border	0.081	0.14184	2.45	3.66	+1.21	0.00304	0.00161	.....
	Middle	0	0.14083	1.73	4.50	+2.77	0.00203	0.00161	+25
	Original	0.05	0.14130	.....	.....	.....	.....	.....	.....
2	Border	1.47	0.14666	4.00	4.80	.....	0.00536	0.00161	.....
	Middle	0.17	0.14476	2.65	6.45	.....	0.00346	0.00161	+120
	Original	0	0.14057	.....	.....	.....	.....	.....	.....
	10 mm.d.	0.49	0.14415	2.54	3.84	+1.30	0.00358	0.00140	.....
	20 mm.d.	0.12	0.14324	1.90	3.30	+1.40	0.00267	0.00140	.....
3	40 mm.d.	0.07	0.14286	1.63	2.10	+0.47	0.00229	0.00140	.....
	40 mm.d. Border	0.11	0.14347	2.06	.....	.....	0.00290	0.00140	.....
	40 mm.d. Middle	0.05	0.14283	1.61	.....	.....	0.00226	0.00140	+55

Technically important conclusion which may be drawn from data is that measurement of changes in length shows high values for cast Fe growth, which at times becomes very appreciable. Since in past all values for growth were obtained in this way, cast Fe seemed poorer than it actually is. Use of thin samples in laboratory likewise gave higher values for growth, than was shown subsequently for thick-walled castings. In general, it may be stated that past measurements on growth of cast Fe should be used only for qualitative comparisons. Swelling of castings, especially of thick-walled ones, is actually rather small. DTR (6)

Recent Investigations on Plane State of Stress by Photoelastic Method. (Neuere Untersuchungen über ebene Spannungszustände mittels der photoelastischen Methode.) L. KETTENACKER. *Der Bauingenieur*, Vol. 13, Nov. 18, 1932, pages 582-583. Author summarizes results of recent photo elastic investigations on states of stress. Discussion refers to (1) states of stress in bent bars, (2) stress distribution in notched bending and tension bars, (3) stresses in hooks. 9 references. GN (6)

Magnetized Steel and Magnetic Measurements. (Magnetstal och magnetiska mätmetoder.) H. ROTH. *Jernkontorets Annaler*, Vol. 114, Nov. 1932, pages 537-549. General discussion of influence of foreign elements on magnetic properties of steel and methods for testing them. HCD (6)

Value, Scope, and Interchangeability of Mechanical Tests. Correspondence from WALTER ROSENHAIN, *Metal Progress*, Vol. 21, June 1932, pages 57-58. Urges adoption of an international standard, notched bar impact test and comments on prevailing tendency to attach undue importance to tensile strength tests as a basis for accepting or rejecting material when data on other physical properties and chemical analysis are not at hand. WLC (6)

Results of Stamping Tests and Their Relation to Tensile Tests. (Sur les résultats fournis par les essais d'emboutissage et sur leur relation avec les essais de traction.) HENRI FOURNIER. *Comptes Rendus*, Vol. 195, July 25, 1932, pages 327-329. Effects of amount of cold-working of different metals and alloys on results obtained in stamping tests of Siebel, etc., were investigated. Tensile characteristics of cold-worked materials were also examined. It is concluded that Siebel-Pomp test is suitable for metals which exhibit large elongations, while Persoz and Erichsen tests are preferable for materials with small elongations and enable variation of properties with treatment to be followed over a large range. Neither method can be simply related to tensile test, but some approximate relations can be given in special cases. OWE (6)

Examination of Welded Seams with Iron Filings. (Untersuchung von Schweissnähten mit dem Feilspäneverfahren.) EBEL. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, July 23, 1932, page 735. See "Investigations of Weld Seams with the Filings Testing Method," *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 36. Ha (6)

Brass as a Material in Fine Mechanics. III. The Principal Testing Methods and Present Status of Standardization of Brass Semi-Finished Goods. (Messing als Werkstoff in der Feinmechanik. III. Die hauptsächlichsten Prüfungsmethoden und der Stand der Normung von Messinghalbfabrikaten.) K. GROTEWOLD. *Feinmechanik und Präzision*, Vol. 40, Oct. 1, 1932, pages 161-165. Preparation of samples and methods of testing according to German rules is described and materials standardized up to present tabulated. Tensile test, deep-drawing tests, and bending tests are explained. Ha (6)

Calibration and Accuracy of Testing Machines. (Eichung und Genauigkeit von Prüfmaschinen.) W. ERMLICH. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 499-514. Records of the calibration of several testing machines are shown graphically with emphasis on the necessity of finding and remedying the cause of inaccuracies, rather than merely making a calibration. HWG (6)

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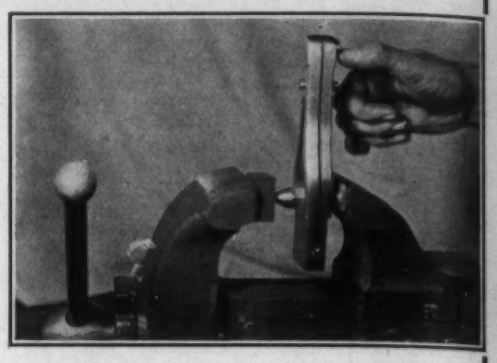

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Cast Iron and Methods for Testing. (Der Grauguss und seine Prüfmethoden.) E. PIWOWARSKY. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932, pages 15-38. The effect of Si, P, Al, Ni and Cr on hardness and the combined C is shown by a family of curves for varying wall thicknesses. Runnability, shrinkage and casting stresses are discussed briefly. German methods for determining tensile and transverse strength and hardness are given and conversion curves on gray and hard irons are shown between Brinell, Rockwell B and C, Shore and Herbert figures. Shear, endurance, machineability and wear testing are discussed. Growth, electric and magnetic properties are briefly dealt with. The article is in the nature of a correlated abstract and the wealth of references to recent foreign literature makes it valuable to one seeking more detailed information. See also "Gray-Iron and its Testing Methods," *Metals & Alloys*, Vol. 3, July 1932, page MA 208. 75 references. HWG (6)

Testing Hardness of Metals by the Vickers Diamond Pyramid Machine. F. J. PEARSON. *Commonwealth Engineer*, Vol. 19, Jan. 1, 1932, pages 208-211. The Brinell hardness testing machine has become universal. With it the hardness number is given by the load in kg. divided by the surface of the impression in mm.^{2}. The ideal size of the ball is .375 times the ball diameter. When the hardness of the metal exceeds half that of the indentation ball (900-1000) the method is at fault as the ball deforms and the results become unreliable. The Vickers pyramid hardness testing machine has been designed to overcome the defects of the Brinell and to give accurate results on very hard metals and to be applicable to all classes of work, including finished parts and very thin sheets. The indenter is a diamond and the hardness number is the load divided by the impressed area. The diamond is cut to the shape of a low square based pyramid. The load varies from 1-120 kg. WH (6)

The Rockwell Superficial Hardness Tester. V. E. LYSAGHT. *Metals & Alloys*, Vol. 3, Aug. 1932, pages 185-188. Discusses requirements of a hardness test which would be satisfactory for measuring hardness of thin objects like safety razor blades and the case of nitrided articles. A new hardness tester with lighter loads than the standard "C" scale Rockwell and more sensitive depth measuring device is described. Curves are given showing relation between load and hardness numbers, and results obtained by use of this new instrument in determining hardness of nitrided cases at various depths. WLC (6)

Static Strength of Welded Joints. (Zur statischen Festigkeit von Schweissverbindungen.) R. MALISIUS. *Elektroschweissung*, Vol. 3, Dec. 1932, pages 225-228. Author investigated whether and how weld seams detrimentally influence elastic and tensile properties of constructions at given conditions of operation. Static tensile tests were made on welded samples of 3 various steels in using 6 different welding rods and electrodes. Samples with seam showed about same elastic elongation as base metal. Seams frequently cause a very small decrease of modulus of elasticity. Seam increases yield point. Results show that in static tests below yield point arc welding with common electrodes has no detrimental effect on construction, provided shrinkage stresses and welding faults are absent. Author suggests a sample with longitudinal seam for tensile tests. For elongation at fracture, ratio of yield point to ultimate strength of sample with longitudinal seam is indicative. Values of such samples depend on cross-sectional ratio, i.e. ratio of cross-section of seam to total cross-section. In order to obtain comparable values this ratio should be between .3-.4. GN (6)

Accuracy of Measurement and variability of Test Results. F. C. LEA. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 492-498. Brief general discussion of variations in mechanical testing arising from errors of the equipment. Ordinary routine testing may show errors of 1% in tensile strength, 2% in hardness, and 5% in endurance. Many recorded variations in modulus of elasticity are due to the extensometer rather than to the material tested. HWG (6)

Fatigue of Metals & Alloys (6f)

The Dependence of Endurance Strength on the Crystal Orientation. (Ueber die Abhängigkeit der Dauerfestigkeit von der Kristallorientierung.) W. Fahrenhorst, K. Matthaes & E. Schmid. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Aug. 13, 1932, pages 797-799. Static and dynamic tests were made with electrolytic Cu sheets which had been given a fairly perfect parallel orientation by cold rolling and recrystallization. Alternate strength varies according to orientation from 10.7 to 12.3 kg./mm.^{2} and corresponds in its course almost exactly to static tensile strength. Dependence on orientation gives new clues to investigation of fatigue phenomena in crystals and shows importance of structure of a piece with regard to endurance strength. Ha (6f)

Alloys Superior to Carbon Steel in Endurance Test of Valve Springs. P. M. Heldt. *Automotive Industries*, Vol. 67, Nov. 26, 1932, pages 672-675, 681. Writer points out that one of greatest sources of weakness in high-speed engines is valve springs. A surging action often occurs which causes stresses far greater than those due to normal working cycle. This surging often leads to failure. Breaks from surging generally occur about 1 convolution from end and show all of characteristics of fatigue failure. Writer describes systematic investigation of valve-spring failures carried out several years ago at Royal Aircraft Establishment in Farnborough, England. Fatigue tests on 6 different grades of spring steel were made and results are in curve form and fully discussed. Methods are given for minimizing surge. DTR (6f)

The Endurance Strength of Cast Iron. (Die Dauerfestigkeit des Gusseisens.) Paul A. Heller. *Die Giesserei*, Vol. 19, Aug. 5, 1932, pages 301-305; Aug. 19, 1932, pages 325-332. Review of work done in determining endurance properties of cast Fe permits following conclusions: Cast Fe possesses, in spite of its pronounced brittleness, definitely characterized endurance strength. While vibration strength for bending has been well determined, that for tension, compression and torsion have not been carried out to a definite conclusion. Cast Fe does not follow Hooke-law for material, as it shows a plastic deformation at low stresses. The better the quality of cast Fe, i.e. the finer the graphite, the greater the surface sensitivity which, however, remains lower than in ductile metals. Relations between endurance properties and static strength values seem to exist only between tensile strength and bending vibration strength; this ratio varies between 0.4 and 0.6. Fatigue of cast Fe in bending seems to take place at many places simultaneously. Increasing C content reduces the vibration strength and increases damping capacity. Increasing content of pearlite seems to improve vibration strength. Influences of structure and temperature on this property have not yet been satisfactorily elucidated. Size of test sample is of great influence on result; too small samples should be avoided. Corrosion can greatly influence endurance strength, especially in presence of water. Many more investigations are required to clear up behavior of cast Fe under all conditions. 56 references. Ha (6f)

A Corrosion-Fatigue Study of Low Carbon Steel. Wilber E. Harvey & F. Jerome Whitney, Jr. *Journal American Welding Society*, Vol. 11, Oct. 1932, pages 12-19. Paper presented at Fall meeting of American Welding Society in Buffalo, Oct. 1932. Effect of welding upon the corrosion-fatigue limit of a low-C steel is not deleterious except in case of bare wire welds. Authors found corrosion-fatigue limits as follows: Bare wire arc welds, 9000 lbs./in.^{2}; covered wire arc welds, 14,000 lbs./in.^{2}; atomic H welds, 17,000-18,000 lbs./in.^{2}; oxy-acetylene welds, 19,000 lbs./in.^{2}; flash welds, 24,000 lbs./in.^{2}. Grain size does not seem to have any effect upon corrosion-fatigue limit of welded materials while impurities such as slag particles lower resistance of welded materials to combined action of corrosion and fatigue stresses. TEJ (6f)

Material Properties at Fatigue Loads. (Werkstoffeigenschaften bei Wechselbeanspruchung.) W. Buchmann. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 37-44. Paper presented at 25th anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstalt, Oct. 29, 1932. Discusses phenomena of fatigue fracture which occur as soon as fatigue limit is surpassed in locally restricted small areas. Such local stress maxima are highly dangerous in alternating loading. Materials of construction react differently to such local stress maxima and also show a variable sensibility to notch effects. Height of permissible effective stress, therefore, essentially depends on notch sensibility. Notch sensibility is a material property just as important as fatigue limit itself, for there are no constructions without notch effects. GN (6f)

Fatigue Properties of Welded and Cast Constructions. (Dauerfestigkeit geschweisster und gegossener Konstruktionen.) Th. Lipp. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 73-79. Paper presented at 25th anniversary of Staatliche Materialprüfungsanstalt, Technische Hochschule Darmstadt, Oct. 29, 1932. Whereas former investigations on fatigue properties of welds were generally made on round and flat bars and tubes, author tested simple structural members. Tests show that fatigue properties of welded constructions depend on (1) tensile strength of material used, (2) geometric shape of transitions between different cross-sections and (3) on surface conditions. Fatigue properties of welded parts can be considerably decreased by unsuitably shaping the welds. Poor surface condition particularly affects fatigue limit of cast steel, whereas cast Fe is rather insensible towards notch effects and surface defects so that fatigue limit of smooth bars may be attained. Results show that further experiments which are in progress should aim at a detection of faults which occur during processing of cast and welded parts. GN (6f)

Fatigue and Corrosion. (Ermüdung und Korrosion.) E. Kreissig. *Verkehrstechnik*, Vol. 49, Jan. 25, 1932, pages 42-43. Very pronounced effect of corrosion upon endurance strength is stressed and data of Thoma on electric steel axles are reported. A spring steel showing 176 kg./mm.^{2} tensile strength yielded 76 kg./mm.^{2} endurance strength in the dry state and only 8.4 kg./mm.^{2} when wet. The Waggon-Fabrik Uerdingen sponsored tests on hardened spring steels investigating the effect of corrosion upon tensile and compressive endurance strength. Marked decrease in endurance strength is ascribed to the diffusion of liberated hydrogen into Fe during corrosion. Attention is called to the role which atomic hydrogen plays during pickling and electro-deposition. EF (6f)

Study of Damaged Electrical Transmission Cable. (Mitteilungen der Deutschen Gesellschaft für Metallkunde Ausschuss für Aluminiumleitungen.) *Zeitschrift für Metallkunde*, Vol. 24, Nov. 1932, pages 285-288. Committee report of deutschen Gesellschaft für Metallkunde. Breaks in cable used for transmission of heavy currents are not unusual. Fatigue of cable under repeated bending is an important factor; data are given for the fatigue of Cu, bronze, Al, Aldrey. But several other factors contribute, especially manner of clamping cable to supports. New types of clamp are much improved over the old. RFM (6f)

On the Fracture of Electric Transmission Cables. (Über Bruchgefahr von elektrischen Freileitungsseilen.) F. Wunderlich. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 59-63. In calculating tensile properties of power cables static as well as oscillating loads (wind) must be taken into consideration. Static loads are to be based on fatigue limit since such cables are generally made of non-ferrous metals whose fatigue limits are far below static tensile strength. For oscillating loads fatigue limit at highest static initial stresses is decisive. Reports results of fatigue tests on steel-Al cables. All fractures, in accordance with results of practice, occurred on suspension grips. It is shown that under unfavorable conditions on grips fatigue fractures occurred at oscillations which amounted to but about 1/10 of actual fatigue limit for Cu cables and to but 1/20 for steel-Al cables. 2 methods of eliminating such fatigue failures are discussed: (1) improvement of grips, (2) elimination of oscillations by suitable damping devices. GN (6f)

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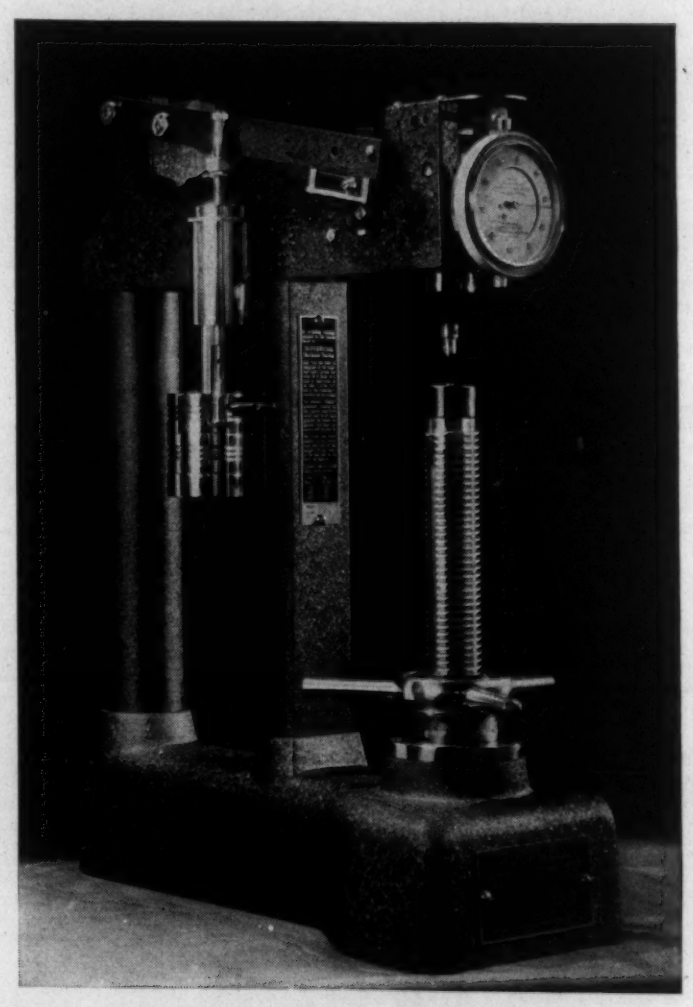

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Investigation into Axle Fractures. (Untersuchung von Achsbrüchen.) *Verkehrstechnik*, Vol. 49, Feb. 15, 1932, page 94. **Axle Fractures of Railroad Cars and Their Causes. (Achsbrüche von Eisenbahnfahrzeugen und ihre Ursachen.)** R. Kühnel. *Glasers Annalen*, Vol. 110, Feb. 15, 1932, pages 29-37; Mar. 1, 1932, pages 41-52. Reviews a paper of Kühnel before Deutsche Maschinentechnische Gesellschaft on official investigation into the breaking of locomotive, passenger and freight car axles of the German State Railroad. Inhomogeneities in central parts of axles are not always dangerous. In spite of pipes, fracture starts from outside. Cracks resulting in fatigue fractures in course of years are detected by petroleum or oil. Running hot of axles and axle journals is generally cause of failures due to fatigue. This was corroborated by material testing. Tests proved straight exit of axle from wheel boss reduces endurance strength by 50%. Rusting at this part may lead to corrosion in moist atmospheres and thus result in fatigue failure. EF (6f)

Corrosion Fatigue Tests of Nitrided Steel and Nickel Plated Steel in River Tees Water. N. P. Inglis & G. F. Lake. *Transactions Faraday Society*, Vol. 28, Sept. 1932, pages 715-721. Nitralloy with 1.58% Cr, 0.87% Al, 0.33% Mo, 0.26% C, and mild steel coated with Ni 0.02" thick, and mild steel hardened by heating for 4 hours at 900° C. in a mixture of 50% NaCN and 50% Na_2CO_3 and double quenching from 890° C. in oil and from 780° C. in water, grinding, leaving a case 0.10" deep, were all tested in rotating beam type fatigue machine while water from river Tees dripped on them at rate of a few drops per second. Analysis of water was: total solids 2954, lime 49, magnesia 164, SO_3 176, Fe_2O_3 and Al_2O_3 0.4, Cl 1441.0 parts per 100,000. Results showed that Ni coated steel did not fail after 73,050,000 cycles at $\pm$ 11.5 tons/in.^{2} in air but broke at 170,417,600 cycles at $\pm$ 3.7 tons/in.^{2} in water, fatigue and corrosion fatigue limits being 11.2 and 3.0 respectively. Nitrided nitralloy in water was unbroken after 101,000,000 cycles at $\pm$ 24.8 tons/in.^{2}, but unnitrided nitralloy broke after 11,320,350 cycles at $\pm$ 5.4 tons/in.^{2}, corrosion fatigue limits being $\pm$ 25 and $\pm$ 5, respectively. Fatigue limits were $\pm$ 37 and $\pm$ 33 tons/in.^{2}, respectively. Case hardened material had not failed at 70,000,000 cycles at 12.5 tons/in.^{2} stress range in water. Internal stress in Ni deposit acted as an added stress and altered actually applied fatigue range: cracks starting in Ni propagated through steel. Nitrided steel depends upon coat for corrosion resistance: fatigue failure commenced in core and nitrided case flaked off. PRK (6f)

A Study of Stresses in Car Axles Under Service Conditions. H. F. Moore, N. H. Roy & B. B. Betty. *Bulletin 244, Engineering Experiment Station, University of Illinois*, May 20, 1932, 80 pages. Describes field tests on lines of Chicago Rapid Transit Elevated Railway in which stress in car axles was measured by change of inclination of upper part of car wheels. This change of inclination was measured by a floating telescoping tube with a mechanical multiplication of its motion, and measurement of this motion was transferred to a traveling record sheet by means of a jump spark at points on indicator dial and at mating points spaced below indicator sheet. Methods of translating wheel inclination into terms of axle stress, and of eliminating effects of vibrations in apparatus are discussed. Tests covered some 200 miles of travel over the system. Summarizes previous laboratory tests on fatigue strength of axle steel, and on probable fatigue strength of axles with fillets. No stresses were measured in service sufficiently high to *start* a fatigue crack in axle steel. A few stresses were observed in service sufficiently high to *spread* a fatigue crack once it was started. These high stresses were found to occur so infrequently that even if a fatigue crack should be somehow started, there seems to be very small probability of its spreading to failure in 100,000 miles in service. Test results tend to justify practice of examining elevated railway car axles for cracks after each 100,000 miles service. High bending stresses in axles were found to be caused by too wide spacing of guard rails, narrow gage at frogs and crossings and sudden change of direction of wheel flange at switch points. As a car passes around a curve the wheels and axles of the trucks seem to adjust themselves to the curve by a series of sudden "jumps" rather than by gradual slipping. Some discussion of proposed modifications for methods of axle design is given. HFM (6f)

Oscillating Test in Pulsating Machines. (Schwingungsprüfung auf Pulsatormaschinen.) E. Lehr. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Feb. 27, 1932, page 213. Machine is described in which specimen can be subjected to alternating tensile stresses with superimposed compression stresses of up to 60 kg./mm.^{2} Endurance tests can also be made. Ha (6f)

Fatigue Cracks in the Beaded Areas of Tubes and the Beading Properties of Various Materials. (Ermüdungsrisse in den Einwalzstellen von Siederohren und Einwalzbarkeit verschiedener Werkstoffe.) W. Ruttmann. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 63-68. Paper presented at Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. Supposition held for a long time, that annular cracks apparent in beaded areas of boiler tubes are bending fatigue failures was substantiated by author in tests carried out in a specially designed machine. Mode of action of this apparatus in which whole tubes could be subjected to bending oscillations in beaded section is briefly described. Fractures of tubes tested with this apparatus show a striking similarity to those that failed in boilers. Oscillations and thermal stresses are reasons for fatigue failures of such tubes. Fatigue properties of beaded joints could be increased by 50% by suitable beading. Material conditions between drum and tube material required for good beading are discussed. GN (6f)

The Strength of Materials as Affected by Discontinuities and Surface Conditions. F. C. Lea. *Journal Society of Glass Technology*, Vol. 16, June 1932, pages 182-209. Experiments are described to determine the effect of discontinuities and surface conditions of metals on the behavior of the materials under cycles of repeated stress. The effects of scratches, screw threads, grooves, keyways, drilled holes and other discontinuities reduce the safe fatigue range considerably, both under cycles of stress and blows. The effect of Ni deposits is discussed. The static and dynamic impact tests, corrosion tests under repeated stresses and on the influence of heat treatment are described in detail. A micro-examination of the specimens tested suggests that the reason for failures must be found in a crystal boundary effect, probably oxidation, as distinct from decarburization, the oxidized boundary acts as a discontinuity and causes concentration of stress. Ha (6f)

Stress Corrosion of Metals. D. J. McAdam, Jr. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 1, 1932 pages 228-246. 15 references. See *Metals & Alloys*, Vol. 2, Nov. 1931, page 256. HWG (6f)

Effect of Corrosion on Fatigue Limit. (Einfluss der Korrosion auf die Dauerfestigkeit.) H. Ochs. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 55-59. Paper presented at 25th anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. Discusses causes of detrimental effect of corrosion on fatigue properties of materials. Every means which decreases tensile stresses at alternating loads improves fatigue properties under simultaneous corrosion. This is achieved by producing artificial initial compressive stresses. They decrease tension stresses during loading thus closing surface cracks and decreasing their sucking action. By this method corrosion fatigue strength could be considerably increased, for instance, for a low C steel by 50%. This method proved particularly successful for machine parts endangered by notch effects due to changes of cross-section. Results on nitrided steels (smooth, unnotched bars) substantiate tests by Mailänder (*Krupp'sche Monatshefte*, Vol. 13, 1932, pages 56-81, *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 298). Fatigue fracture never starts on nitrided surface but always at inner edge of nitrided layer. Fatigue limit is independent of ratio of nitrided layer thickness to bar diameter. It was determined as 49 kg./mm.^{2} in tests with and without corrosion. Conditions are different for notched bars which showed a fatigue limit of 63 kg./mm.^{2} without corrosion but a decreased limit of 43 kg./mm.^{2} under corrosion. In corroded and non-corroded notched bars fracture always starts in outer zone of nitrided layer. GN (6f)

Resistance of Copper and Its Alloys to Repeated Stress. Part I. Tough-Pitch Copper, Annealed and Cold-Worked. Part II. Effect of Impurities in, and Additions to, Copper. Lack of Satisfactory Accelerated Test Methods. H. W. Gillett. *Metals & Alloys*, Vol. 3, Sept. 1932, pages 200-204; Oct. 1932, pages 236-238, MA 314; Nov. 1932, pages 257-262. Author has assembled data obtained by 16 investigators covering resistance of Cu to fatigue. Tables give static and fatigue properties of annealed and cold worked electrolytic Cu, and Cu containing small percentages of As and Bi. 45 references. Part II gives data covering effects of O_2, P, As, Sb, and Fe on fatigue resistance of Cu in various conditions. Accelerated test methods are discussed. 29 references. Part III. Data on this subject from 27 references. 4 tables of fatigue values of the several compositions of Cu-Zn alloys are given. Corrosion fatigue, notch effect, speed effect, accelerated tests, understressing and the effect of Pb are discussed. WLC (6f)

What is this thing called Fatigue?

These abstracts are prepared in cooperation with the A. S. T. M. Research Committee on Fatigue of Metals.

Endurance Fractures by Revolving Oscillations on Electrically Driven Shafts. (Dauerbrüche durch Drehschwingungen an elektrischen Antrieben.) W. Peinecke. *Maschinenbau*, Vol. 11, Aug. 4, 1932, pages 313-316. Practical examples show that in rare cases fractures of this kind are observed on electrically driven shafts. Rather often fractures of parts driven by or otherwise attached to these shafts are encountered because of enduring revolving oscillations. Some cases are mentioned and way of avoiding the danger shown. RFV (6f)

Dynamic Testing of Materials. R. E. Peterson. *Electric Journal*, Vol. 29, Aug. 1932, pages 377-379. Importance of fatigue testing of materials is stressed. Several photographs of various types of testing machines and devices. 24 references. CBJ (6f)

Endurance Tests on Welded Joints. (Dauerversuche mit Schweissverbindungen.) Passau & O. Graf. *Bautechnik*, Vol. 10, Oct. 14, 1932, pages 605-606. Passau reports some results on dynamic properties of welded joints which are in accord with Graf's previous investigation. (*Bautechnik*, Vol. 10, July 8, 1932, pages 414-417.) Favorable results were obtained on welds with electrode "Arcos Stabilend." In one case fatigue limit of a welded round bar amounted to 25 kg./mm.^{2} (static tensile strength of parent metal: 57 kg./mm.^{2}), in another case to 18 kg./mm.^{2}, corresponding to 95% of fatigue limit of parent metal. GN (6f)

Increase of the Fatigue Properties of Construction Parts. (Zur Steigerung der Dauerhaltbarkeit von Konstruktionsteilen.) H. Oschatz. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 44-50. Paper presented at celebration of 25th Anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. Describes 3 possibilities of increasing fatigue limit (1) certain materials show capacity to strain harden during alternating loading (fatigue loading is begun below fatigue limit and load is gradually increased in low load steps during course of test.) A fatigue limit may thus be obtained which is 25-30% above the original fatigue limit, (2) arrangement of additional notches to smooth the flow of force near principal notches, (3) use of artificially produced natural stresses. Third method is most important and interesting. In the tests of the author such natural stresses were produced in a shaft with cross-bore by plastic deformation. The systems of natural stresses were arranged in a way that they did not act with but against the dangerous loads. This may also decrease the fatigue limit. GN (6f)

Permissible Stresses in Riveted and Welded Steel Bridges. (Die zulässigen Spannungen bei genieteten und geschweissten Stahlbrücken.) K. Schaechterle. *Die Bautechnik*, Vol. 10, Oct. 7, 1932, pages 590-593; Oct. 14, 1932, pages 603-605. First part of paper discusses calculation of regulations for structural steels St. 37 and 52 and whether static yield point is a sufficient basis for calculation since dynamic properties are particularly affected by surface conditions of steel. (Influence of rolling skin, notches and holes on dynamic properties.) Rolling skin and surface defects decrease fatigue limit the more the harder the steel. So far only course of limiting fatigue curves on polished samples of steel St. 37 has been determined. However, research on fatigue properties of Cr, Mn, Ni, Cu, W, Mo, V and similar alloy steels is in progress. It is emphasized that in making St. 52 a uniform, smooth and notch-free surface is of extreme importance. Proposals on fixation of permissible stresses for alternatingly loaded structural elements are made. Author refutes 50% increase of permissible stresses of St. 52 over that of St. 37, and advises determining limiting stresses of that steel by fatigue tests. Notches and holes decrease fatigue resistance of St. 52 more than they decrease that of St. 37. Original strength (as defined in previous papers) of St. 37 amounts to about 80% and of St. 52 to about 60% of static yield point on polished specimens. Data are given on electrically and gas welded V- and X-joints of St. 37 with rolling skin. Formation of cracks in fatigue tests of these structural steels as well as reinforcement of riveted constructions by welding are finally discussed. It is pointed out that rules on calculating above mentioned structures according to D I N 4100 contradict results of tests carried out at Technische Hochschule Stuttgart. 16 references. GN (6f)

On Endurance Strength of Screws and Influence of Their Shape, Manufacturing and Material. (Ueber die Dauerfestigkeit von Schrauben in ihrer Beeinflussung durch Formgebung, Herstellungsart und Werkstoff.) A. Thum & W. Staedel. *Maschinenbau*, Vol. 11, June 2, 1932, pages 230-232. By proper shaping, endurance strength of screws can be improved essentially. It is recommended to use a wide screw-thread, small shaft diameter, a good rounding off in base of thread and between shaft and head. It was found that cold rolled-in thread and cut thread with a subsequent pressing of surface was superior to other types. Increase in endurance strength was generally noticed in connection with increase in tensile strength of screw stock. RFV (6f)

The Damping Capacity and Vibration Strength of Steel. (Ueber die Dämpfungsfähigkeit und Schwingungsfestigkeit des Stahles.) Erich Voigt & K. H. Christensen. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, No. 11, 1932, pages 151-167. Behavior of materials under oscillating stresses depends to great extent on their damping capacity. Latter is defined, according to Foeppl, as energy consumed/unit of volume for each stress cycle, or as ratio of energy consumed/stress cycle to energy stored in unit of volume/cycle. This quantity was determined for several steels; unalloyed steels showed a greater damping than alloyed steels; refining reduced damping capacity. Latter depends also on pre-stresses in the material before testing. Relation between damping capacity and vibration strength is not sharply defined. It is not permissible to use static elasticity modulus for calculations of stresses above elastic limit at high load oscillations. New factor is developed from frequency of free oscillations for calculation of stresses which gives values in good agreement with those obtained in endurance bending tests on Schenck's machine. Tests and instruments used are described in detail. 26 references. Ha (6f)

ELECTRO-CHEMISTRY (7)

Effect of Magnetic Field on Electrolysis of Nickel Salts. (Influence du champ magnétique sur l'électrolyse des sels de nickel.) H. FORESTIER. *Comptes Rendus*, Vol. 195, Nov. 21, 1932, pages 954-957. Ni sulphate was used, medium containing H_2SO_4, oxalic acid or ammonia. Cathode and anode were of Pt, and electrolytic cell was placed between poles of an electro-magnet. Results show that magnetic field is without effect when medium is basic, but it considerably diminishes speed of deposition of Ni when acidity of electrolyte exceeds a certain value. Ultimately, as acidity increases, magnetic field tends to stop all deposition. With salts of Zn and of Cu effect of magnetic field is small and may be referred to convection in the electrolyte. OWE (7)

The Theory of Passivity Phenomena. XIV. The Passivity of Nickel. (Zur Theorie der Passivitätserscheinungen. XIV. Über die Passivität des Nickels.) WOLF JOHANNES MÜLLER, H. K. CAMERON & W. MACHU. *Monatshefte für Chemie*, Vol. 59, Jan. 1932, pages 73-92. The passivitation of protected Ni electrodes in H_2SO_4 and Na_2SO_4 solutions of various strengths was investigated with the aid of current-time curves and a polarizing microscope. The oxide coating on Ni is attacked less by H_2SO_4 up to high concentrations than that on Fe. On freshly cut surfaces of Ni the passivation time is short. If the Ni electrode is passivated at less than 1.5 volts a layer of bivalent Ni salt forms. If the passivation is repeated and the coating brushed off, the time can be lengthened. In the same acid strength smaller values are obtained for Ni than for Fe. In 0.1 *N* H_2SO_4 a coating of a basic salt forms. Over 5 *N* solutions produce a double refracting layer consisting of $NiSO_4.7H_2O$, which is more stable in still stronger solutions. Above 2 volts chemical passivity of a porous superoxide layer sets in. At 2 volts in 5 *N* H_2SO_4 pulsations occur which loosen the coating. In dilute solutions the superoxide layer is difficult to remove, in contrast to Fe. On several electrodes treated identically the same pore size in the coating was obtained. A cathode charge activates the Ni. Ni becomes instantly passive in Na_2SO_4 solutions. The conclusions are that the protective coating consists of (a) the natural oxide layer formed by air, (b) basic $NiSO_4$, not double refractive, (c) $NiSO_4 . 7H_2O$, strongly double refractive, or (d) a superoxide of Ni with chemical passivation above 2 volts. The greater stability of Ni oxide than Fe oxide accounts for its better corrosion resistance. 9 references. CEM (7)

Variation of Potential of Electrolytic Iron with pH of the Medium. (Variations du potentiel du fer électrolytique avec le pH du milieu.) A. TRAVERS & J. AUBERT. *Comptes Rendus*, Vol. 195, July 11, 1932, pages 138-139. Observed facts are simply interpreted by supposing that potential of Fe in a solution, which has been thoroughly deprived of air by bubbling H through it, is a function of the pH. In accordance with this hypothesis the potential should become more negative when the pH is increased, and conversely. This is verified for electrolytic Fe in a 1% solution of Na_2SO_4 deprived of O. Potential of Fe may be said to depend on its possible H content. OWE (7)

The Antimony Electrode. (Die Antimonelektrode.) S. BODFORSS & A. HOLINQUIST. *Zeitschrift für physikalische Chemie*, Abt. A, Vol. 161, Aug. 1932, pages 61-68. The potential of the Sb electrode depends on the nature of the acid and of the metal. Measurements on Sb, electrodeposited from fluoride melts and on freshly scratched surfaces of molten metals yield potentials which are more negative than those of cast or amalgamated metal. EF (7)

Electroplating (7a)

"Cold baths" in chromium-plating. ("I bagni freddi" per chromatura.) O. MACCHIA. *L'Industria Chimica*, Vol. 7, July 1932, pages 879-882. A discussion of the recent developments in the use of "cold baths" in chromium-plating. AWC (7a)

Chromium Plating as Surface Hardening Means. (Verchromung als Oberflächenhärtung.) H. LEISER. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Feb. 1, 1932, pages 58-60. Attention is focused on scratch hardness ratio 22:7 between Cr deposits and "best hardened steels" in favor of former. Extensive use of Cr plating for measuring instruments in U.S.A. is emphasized and advantages of Cr plated drills, files, knives, etc., are stressed. Tools must be heat-treated after being plated. EF (7a)

Translucent Metal Foils. (Durchsichtige Metallfolien.) *Oberflächentechnik*, Vol. 9, Aug. 16, 1932, page 169. Process is briefly described which makes possible deposition of fine metal layers of Au, Ag, Fe, Ni, etc., electrolytically on a chemically different base metal and later dissolving this base in a suitable acid. Foils of 0.00001 mm. have been produced in this manner which were perfectly translucent but possessed relatively high strength, elasticity and homogeneity which made them very useful for application as diaphragms of nearly no inertia in sound transmission and other physical experiments. Ha (7a)

Nickel and Chromium Plating of Aluminum. (Le nickelage et la chromage de l'aluminium.) *Revue du Nickel*, Vol. 3, Apr. 1932, page 54. Ni is electro-plated on a very thin layer of Fe deposited on Al surface by dipping in a hot slightly acid solution of Fe perchloride. This method is simple and gives a very strong adhesive layer of Ni on which Cr can be easily plated. AH (7a)

Hygiene in Chromium Plating Plants. (Die Hygiene in Verchromungsbetrieben.) *Oberflächentechnik*, Vol. 9, Dec. 6, 1932, pages 239-240. Harmful effects of chromic acid vapors on respiratory organs and their treatment are briefly explained. Means for minimizing formation and escape of acid mists and Pb chromate are discussed. An effective exhaustor should always be installed which forces fresh air into room, not one which sucks stale air out. Ha (7a)

Progress in Nickel Plating. (Fortschritte in der galvanischen Vernickelung.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Dec. 11, 1932, pages 658-659. Survey on recent problems in Ni plating technique and solutions used. Development of recent years aims at (1) a better protective action and adherence of plating, (2) higher efficiency, (3) improvement of mechanical equipment for automatic operation. For increasing adherence, proper cleaning before plating is stressed. Throwing power of plating baths is especially dealt with, with special reference to factors affecting throwing power. Rapid plating baths are considered. GN (7a)

Defects in Nickel Plating. L. WRIGHT. *Electrician*, Vol. 109, Nov. 25, 1932, pages 676-678. Early history of Ni plating is reviewed. Properties of pure Ni are listed. Porosity is a common defect always present in thin coatings. Distribution and nature of porosity can be determined by use of ferroxyl test papers. Pitting is more often found in carelessly produced heavy coatings and results chiefly from dirty solutions. Peeling may occur during plating or later during machining or service conditions. Adhesion to base metal is governed by plating procedure and by treatment previous to plating. Irregular current supplies during plating results in a laminated deposit which is conducive to peeling. Rough and nodulated deposits are caused by faulty operation or lack of chemical control. CBJ (7a)

Tension of Electrolytic Deposits of Metals. (La mésure des tensions des dépots électrolytiques de métaux.) C. MARIE & N. THON. *Comptes Rendus*, Vol. 193, July 27, 1931, pages 233-236; *L'Industrie Electrique*, Vol. 41, Jan. 10, 1932, page 24. Measurements are described which permit of the evaluation of the forces arising when metallic deposits are formed. Knowing the flexibility of the cathode plate on which the deposit forms, it is possible to calculate magnitude of the forces. The order of magnitude of the surface tension in the deposited layer can be calculated from the Laplace equation. For the plate used it is of the order of 1 g./cm. but depends on the flexibility of the cathode which determines the curvatures of the layer. MS + OWE (7a)

Chromium Plating Literature. VII and VIII. L. H. DECKE. *Brass World*, Vol. 28, Nov. 1932, page 226; Dec. 1932, pages 247-248. Discussion of applications of Cr plating. WHB (7a)

Practical Plating. E. A. OLLARD. *Metal Industry*, London, Vol. 41, Aug. 12, 1932, pages 157-159; Aug. 26, 1932, pages 205-206; Sept. 9, 1932, pages 255-256; Oct. 14, 1932, pages 375-376; Oct. 28, 1932, pages 425-426; Nov. 18, 1932, pages 497-499; Dec. 2, 1932, pages 545-546, 548-549. Various phenomena associated with electroplating are explained and a diagram shows how voltage across a cell is made up of different parts of anodic and cathodic voltages. Factors governing structure of deposited material are discussed; size of crystal is usually reduced with increasing polarization. Conception of throwing power of a solution is explained as that power which a solution possesses of adjusting difference of distances of parts of cathode from anode so that about same deposit is obtained irrespective of distance. Layout of plating shop and plant, tanks, various forms of circulating systems, agitating devices, auxiliary equipment and accessories and the measurements for current density, voltage, electrolyte concentration, etc. are discussed. Ha (7a)

Standards for Plated Surfaces. A. J. POUND. *Brass World*, Vol. 28, Nov. 1932, pages 222-223. A set of specifications is tabulated for plating of Pt, Au, Ag, Ni, Ni-Cr, Cd, Zn, and brass, Cu, Sn. WHB (7a)

Micro-Organisms in Plating Solutions. E. A. OLLARD. *Metal Industry*, London, Vol. 42, Jan. 6, 1933, pages 17-18. A scum often forming on surface of Cu and Ni plating solutions has been found to consist of fungus growths the exact nature of which could not yet be determined. It grows quickly around the side of the vat and can clog circulating and filtering systems. An effective remedy has not been found. Ha (7a)

Have you a plating problem?
If you have, these abstracts will help you.

Barrel Rolling and Plating. R. J. O'CONNOR. *Metal Industry*, New York, Vol. 29, Dec. 1931, pages 523-525. From *Monthly Review* of the American Electroplaters Society, Oct. 1931. Includes discussion. Cut down rolling, ball rolling, sawdust rolling, barrel plating and plating solution compositions for Ni, brass, Cu and Cd are described. See *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 244. PRK (7a)

Chromium Bath Anode "IBO-Aktiv". (Chrombadanode "IBO-Aktiv.) R. STAMM. *Oberflächentechnik*, Vol. 9, Oct. 4, 1932, page 201. Author points out that the IBO-anode has been proved superior to other anodes in practical operation on a large scale, not only in laboratory tests as has been said (*Oberflächentechnik*, Sept. 4, 1932). Practical experience showed better results than could be expected from theory. Ha (7a)

Control of Acidity in Low pH Nickel Plating Baths. L. C. PAN. *Transactions Electrochemical Society*, Vol. 59, 1931, pages 385-392. See *Metals & Alloys*, Vol. 2, Sept. 1931, page 174. (7a)

Finishing Aluminium. *Ironmonger*, Vol. 147, Jan. 7, 1933, page 53. Articles are passed through a boiling potash bath, then brushed with milk of lime, dipped in a 0.2% KCN bath, and then in an iron chloride solution (500 g. HCl, 500 g. H_2O, 2 g. Fe). Articles must be thoroughly rinsed after each stage. Matt or frosted finish is obtained by dipping for 20 to 30 sec. in a hot caustic solution, containing 1½ to 2 lb. caustic soda per gallon, rinsed in clean water, and then dipped in a HNO_3 solution containing 1½ parts of concentrated HNO_3 to 10 parts of H_2O, to remove black deposit formed on surface in the caustic soda bath. In plating Al, an intermediary coating between base metal and a Ni deposit is advisable, and generally Cu will be found a better binder than Zn or Fe. A satisfactory nickelling solution is made up of: H_2O 1000 cc., nickel chloride 50 g., boric acid 20 g. worked at 2.5 volts and 1 amp./dm.^{2} Instructions as to the best polishing method for rolled or spun Al articles and castings are appended. GG (7a)

New 14-K White Gold Finish. *Brass World*, Vol. 28, Oct. 1932, page 211. Mark Weisberg Laboratories, Providence, R. I., have developed a 14-k white Au plating bath. Deposit is a uniform white, of great brilliance and possesses a uniform acid-proof finish. Solution can be used in plating all types of metals and over soft solder and other alloys of Sn. Advantages claimed for bath are: (1) it is a cyanide bath and is self-cleaning, (2) no special equipment or control instruments are required, (3) deposit is close-grained, practically non-porous, and of excellent white color, (4) throwing power is good, and basket- or barrel plating may be employed. WHB (7a)

Basic Copper Carbonate. Quality Requirements for Electroplating Solution. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Apr. 15, 1932, pages 376-377. Basic copper carbonate is used in both alkaline cyanide and acid sulphate baths. Specifications recommended for commercial article are: a Cu content of at least 50.0%; foreign oxides, such as Fe_2O_3, SiO_2, etc., not to exceed 1.0%; a soft, fine powdery form free from lumps and grits, and safe and careful packaging. Presence of small amounts of soluble alkalies and sulphates is not detrimental. JN (7a)

Gold-Plating Practice. The Selection of the Bath Corrector. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Mar. 25, 1932, page 309. Plating bath consists normally of a very dilute solution of Au cyanide in a solution of NaCN or KCN. Au cyanide must be replenished periodically during plating process by adding a Au cyanide solution prepared electrolytically or crystals of auric chloride. A number of suitable Au compounds are available on the market. Author recommends use of aurous cyanide (AuCN), as addition of this compound does not build up undesirable chemicals in bath. JN (7a)

Bleaching or Plating of 800/1000 Silver? (Soll man 800/1000 Silber weisssieden oder galvanisieren?) *Deutsche Goldschmiedezeitung*, Vol. 36, Jan. 14, 1933, pages 31-32. Composition of Ag ware is 80% Ag, 20% Cu. Various methods to give this alloy bright color of pure Ag are either pickling and subsequent bleaching or electro-deposition of a thin layer of Ag. In the German Ag industry the formerly generally used bleaching process has been replaced by Ag plating. Advantages of plating over bleaching are discussed. GN (7a)

New Platinum Plating Process. *Brass World*, Vol. 28, Dec. 1932, page 250. New process is said to produce a deposit retaining an untarnishable luster with minimum attention. The process is simple and produces a deposit of tough and uniform thickness. Pt plated anodes are used and plating is carried out at 6-8 amps./ft.^{2} at 2-10 volts, according to size of article to be plated. WHB (7a)

Rhodium Plating Bath. (Das Rhodiumbad.) *Deutsche Goldschmiedezeitung*, Vol. 35, Dec. 17, 1932, page 518. Rh plating which is used to protect jewelry against tarnishing resembles Au plating. Plating time of 2-3 minutes at 2-2½ volts is sufficient, bath temperature 20-25° C. Anodes are pure Pt. GN (7a)

Chromium Plating Methods for Jewelry. (Verchromungsverfahren für Schmuckwaren.) RALPH W. HARBISON. *Deutsche Goldschmiedezeitung*, Vol. 35, Dec. 17, 1932, pages 514-515. Paper considers American practice; composition of Cr plating baths, voltage, bath temperature, size of electrodes, etc., are given. GN (7a)

Gold Plating of Tin Ware. (Vergoldung von Zinnsachen.) *Deutsche Goldschmiedezeitung*, Vol. 35, Dec. 24, 1932, pages 3-4. Though Sn-ware can be gold plated direct it is advisable to first Cu or brass plate, since direct Au plating results in spottiness after some time. Au plating method is discussed at length. GN (7a)

Electrometallurgy (7b)

The Electro-Deposition of Tin. JEROME J. COLLINS. *Chemical Trade Journal & Chemical Engineer*, Vol. 91, July 22, 1932, page 77. A new process utilizes a molten electrolyte of anhydrous stannous chloride at a temperature of 270° C. and a current density of 75-100 amp./ft.^{2} at 0.75 volt for the electrolytic production of metallic Sn. JN (7b)

Electrometallurgical Refining of Precious Metal Alloys. (Elektrometallurgische Vor-Raffination von Edelmetall-Legierungen.) W. GRAULICH. *Deutsche Goldschmiedezeitung*, Vol. 36, Jan. 28, 1933, pages 48-50. 2 methods for pre-refining of precious metal alloys are described in detail: method according to Carl and that of Siemens & Halske Co. for refining of double scrap. Data are given on amperage, current density, energy consumption, temperature conditions, etc. Advantages over other methods discussed. GN (7b)

Resistance Limits and Gold Refining. (Resistenzgrenze-Goldscheidung.) HEINZ BORCHERS. *Metall und Erz*, Vol. 29, Sept. 1932, pages 392-398. According to Tamman there is no attack by H_2SO_4 on Au-Ag alloys containing less than 35% Ag and complete solution takes place of alloys of more than 50% Ag. It was found that the Ag in 0.5 mm. thick sheets of 33.3% Au, 66.7% Ag dissolves quickly and completely in 66° Be. H_2SO_4 at 300° C. Samples should be rolled or hammered to 0.5 mm. to hasten solution. Annealing has no effect on solution. Solution is faster in H_2SO_4 than HNO_3 at temperatures near their boiling points. The samples must not be annealed during the extraction process, otherwise solution of Ag will not be complete. If the samples are heated to 320° after partial extraction, it is retarded but finally completed. With 66° H_2SO_4 at 320° the resistance limit is 35.4% Ag. Down to a Au:Ag ratio of 1:1.42, the Ag can be extracted from .5 mm. sheets in 66° H_2SO_4 in 15 min. For 1:1 alloys 10 hours are required. Even when a 1:300 Au:Ag alloy is boiled in H_2SO_4 the Au which remains is in one compact piece. In HNO_3 a brown fragile residue remains. During the H_2SO_4 extraction the Au atoms migrate from their original position to a small kernel due to the action of the heat. In HNO_3 sp. gr. 1.3, the extraction time is twice that in H_2SO_4. Stronger HNO_3 dissolves part of the Au. Traces of Cl in the HNO_3 also dissolve some Au. 14 references. CEM (7b)

The Use of Diaphragms in Industrial Electrolysis of Metals. (Sur l'emploi de diaphragmes dans l'électrolyse industrielle des métaux). B. BOGITCH. *Journal du Four Electrique*, Vol. 41, Dec. 1932, page 461. By using a diaphragm impervious to the electrolyte, concentration of impurities in anodic compartment of a cell can be greatly increased and in the cathodic compartment decreased at the expenditure of about 20% of the current. JDG (7b)

Electrical Measurement of Cyanide Solution Activity. W. E. JOHN & E. BEYERS. *Journal Chemical, Metallurgical & Mining Society of South Africa*, Vol. 33, Aug. 1932, pages 27-34. E.m.f. of pure Au in KCN solutions of varying strength was obtained. Addition of lime increased the potential. Effect of base metal contaminants was studied; minute amounts of Fe^{++}, Fe^{+++}, Zn and Pb salts were depressants; Hg increased the potential. Negative radicals have little effect. A de-aerated solution had a higher potential than an aerated solution by 0.02 volts. Curves of Au dissolution and electromotive force were closely parallel. AHE (7b)

Electro-thermic Refining of Metals. (Die elektrothermische Raffination von Metallen). W. KROLL. *Metall und Erz*, Vol. 29, Sept. 1932, pages 365-367. Distillation can be used as a refining method for Pb-Sn-Sb alloys such as solder. An electric resistance furnace of 34 kw. is described in detail which yields 90% pure Sn from solder by distillation. This process can be used in cases where the Harris process is uneconomical on account of high Pb content. In a typical run a charge of 3220 g. of 47.8% Sn, 1.3% Sb, balance Pb, yielded 1097 g. of 93.25% Sn, 1.05% Sb and 1480 g. 22.62% Sn alloy and 439 g. loss. The Sn found in the distillate is probably carried away mechanically with the Pb. Overheating of the metal must be guarded against. 2 references. CEM (7b)

The Influence of Metallic Impurities on Commercial Zinc Electrolysis. (Der Einfluss von metallischen Verunreinigungen auf die technische Zinkelelektrolyse.) P. RÖNTGEN & R. BUCHKREMER. *Metall und Erz*, Vol. 29, Nov. 1932, pages 449-456. The effect on the Zn yield of varying amounts of impurities was determined in a solution of 10% H_2SO_4 and 8 g./100 cc. Zn at 20° C., using 2000 amps./m.^{2}. Cd had almost no effect, then follow in order of increasing effect Fe, As, Co, Cu, Ni and Sb, Sb reducing the yield considerably. Pb is used as anode material in commercial electrolysis and its effect is unique. With Pb anodes a higher yield of Zn is obtained than with Pt anodes, except when the solution is saturated with $PbSO_4$ or the anodes are surrounded by diaphragms. The harmful effect of Sb increases with increasing acid content, but is reduced by the addition of colloids. When enough Cd is present to reduce the yield below 95% or enough other metals to reduce it below 90% the structure of the deposited Zn is changed considerably. With Fe corrosion takes place, Cd produces a granular deposit and As a rough, granular deposit but no corrosion. 500 mg./l. of Cu corrodes, especially around the edges. Higher Cu forms a spongy deposit all over and with over 1000 mg./l. Cu no Zn deposits at all. With Ni present Zn alternately deposits and dissolves producing irregular patterns. 1 mg./l. of Sb without a colloid causes a poorly adhering deposit, and with 20 mg./l. the Zn falls off the cathode in balls without any corrosion at the cathode. With 10 mg./l. of Sb and 2 g./l. of gelatine the deposit is very good. The impurities in the solution must be very high before they deposit with the Zn in noticeable quantities. The yield of Zn is the algebraic sum of the Zn liberated and dissolved during the electrolysis. The impurities are liberated according to their position in the electromotive series, the noble metals being liberated before or with the Zn. The base metals cannot be liberated unless present in very large quantities. Cu acts as a very noble metal, is liberated in dilute solutions and causes sponginess. Co acts similarly to Cu, but in higher concentrations Cu reduces the yield more than Co. The potential of Ni is lower than that of Cu, less is liberated in dilute solutions, and there are fewer corrosion nuclei. At the current densities used Ni has a nobler potential than Cu, so that the corrosive effect spreads out more. As has a low critical current density and only a small tendency to redissolve the Zn. Sb acts similarly to As, but has a greater tendency to form a protective layer. Because its potential is close to that of Zn it does not corrode. 6 references. CEM (7b)

Electrolytic Refining of Sn. (Zur elektrolytischen Raffination von Zinn.) *Die Metallbörse*, Vol. 22, July 23, 1932, pages 930. Raw tin of Ikuno Mines (90-96 Sn, 2-5 Cu, 0.3-0.7 Pb, 0.3-0.6 Bi, 0.07-0.21 Fe, 0.4-0.6 As, 0.5-0.6 Sb) was experimented with by Z. Kimura in a great number of electrolytes. Best suited bath is: 5.5 SiF_6, 6.0 H_2SO_4, 3 Sn, 0.1 glue, 0.01 beta-napthol and small quantities of HF. Hydrolysis of Sn salts is prevented by fluosilicic acid. If Pb is main contamination acid can be omitted. Sn and Bi in electrode slime are extracted by hot H_2SO_4, Cu being insoluble. Bi is recovered by cementation and Sn by electrolysis with insoluble anodes. EF (7b)

Direct Preparation of Magnesium-Aluminum Alloys from fused Electrolyte. (Direkte Darstellung von Magnesium-Aluminiumlegierungen durch Schmelzflusselektrolyse.) ROBERT WEINER. *Zeitschrift für Elektrochemie*, Vol. 38, Apr. 1932, pages 232-240. Carnallite with Al plus 2% CaF_2 was melted in small Jena glass crucibles and electrolyzed at 600°-640° C., graphite electrodes being used. With a current density at the cathode of 1.5 amp./cm.^{2}, a current efficiency of 85-90% was obtained. Voltage was 5.5 and power consumed was 13-15 kw.hrs./kg. Mg. Cathode could be built up to over 90% Mg. Results were reproducible on a larger scale. 11 references. Ha (7b)

German Electrolytic-Metal By-Products. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Apr. 29, 1932, page 436. Abstract of article by W. Schopper in *Metallgesellschaft*, Apr. 1932. See *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 299. JN (7b)

INDUSTRIAL USES & APPLICATIONS (9)

Powdered Metals by Electrolytic Methods. JOSEPH ROSSMAN. *Metal Industry*, N. Y., Vol. 30, Aug. 1932, pages 396-397; Oct. 1932, page 436; Nov. 1932, pages 468-469. An extended review of patents covering the manufacture of powdered metals. PRK (9)

Use of Duralumin in Mining Industry. (L'Emploi du Duralumin dans l'Industrie Miniere.) J. OTTELET. *Cuivre et Laiton*, Vol. 5, Dec. 30, 1932, pages 585-586. Skips and cages made of duralumin of 94% Al, 4% Cu, 0.5% Mn, 0.5% Mg, 0.6% Fe, 0.4% Si have proved to be of great economic advantage. A comparison of a cage for 8 cars made of steel and duralumin and a useful load of 4200 kg. showed a weight of 5500 against 2000 kg. respectively and meant a gain of 80,000 kg. and an annual saving of 42,800 Fr. in a certain case. Ha (9)

Experiences in Building Airplane Motors. (Konstruktionserfahrungen beim Bau von Luftfahrzeugmotoren.) OSKAR KURTZ. *Zeitschrift für Flugtechnik und Motorluftschiffahrt*, Vol. 23, Dec. 14, 1932, pages 691-701; Dec. 28, 1932, pages 721-730. Report No. 307 of Deutsche Versuchsanstalt für Luftfahrt, presented at 21st annual meeting of Wissenschaftliche Gesellschaft für Luftfahrt, June 24, 1932, Berlin. Second installment of paper (part IV) is of interest to metallurgists in that it deals with materials used for pistons, valves, bearings, crankshafts, motor cases and Diesel airplane engines. GN (9)

Steel in Small House Construction. (Stahl im Kleinhausbau.) OTTO MEYER-OTTENS. *Stahlbautechnik*, supplement to *Montanistische Rundschau*, Vol. 24, Dec. 1932, pages 1-8. Detailed description of various types of steel houses. Discussion of how use of steel affects construction of dwellings. GN (9)

This is the age of metals and alloys.

Whether it is a tiny piece of some relatively rare metal for a radio tube or a huge alloy casting for an oil still. These abstracts will tell you what is going on.

Construction of Metal Railway Passenger Coaches. (La Construction des Voitures Métalliques de Chemins de Fer). R. SARAZIN. *Bulletin de la Société des Ingénieurs Soudeurs*, Vol. 3, Jan-Feb. 1932, pages 499-510. Lecture before Société des Ingénieurs Soudeurs. Details concerning method of construction of passenger coaches by 2 French railways are given. Concerning nature of steel plates to be used, author states: Future improvements will deal with quality of plates; it is desirable to look for steel of high strength and high corrosion resistance. Welded seams should be as resistant to corrosion as plates themselves. It is hoped that alloy steels with Ni, Mo, V, etc., will be more largely used to afford a weight reduction which will offset their higher initial cost. FR (9)

New Developments in Stainless Metals. C. C. SNYDER. *American Metal Market*, Vol. 39, June 10, 1932, pages 6-8; June 11, 1932, pages 7-8. Address before Joint Session of National Association of Purchasing Agents, 17th Annual International Convention, Detroit, Mich., June 6-9, 1932. DTR (9)

Receiving and Classification of Sheet Iron and Principal Non-Ferrous Metals. (Reception et classification des toles fontes, et principaux métaux non-ferreux.) GERARD DE SMET. *Aciers Spéciaux, Métaux et Alliages*, Vol. 7, May 1932, pages 182-190. General description of principal metallic products used in industry including characteristics and specifications from point of view of consumer. GTM (9)

Metallurgical Problems in Shipbuilding. (Die metallurgischen Probleme im Schiffbau.) BR. SCHULZ. *Schiffbau, Schiffahrt und Hafenbau*, Vol. 33, Aug. 15, 1932, pages 258-259. Covers the metallurgical problems involved in battleship building, introduction of light metals and utilization of new materials intended to meet the technical advancements in shipbuilding. WH (9)

Applicability of Zinc Die Casting. (Anwendungsmöglichkeiten des Zinkspritzgusses.) FRANZ SCHLESINGER. *Der Werksleiter*, Vol. 6, Sept. 10, 1932, pages 211-215. Considers composition of Sn-Pb, Zn and Al die casting alloys, discusses advantages, proper selection and mechanical properties of such alloys and gives a detailed outline of use of Zn die casting alloys for clocks, watches, typewriters, counting machines, office supplies, trinkets, toys, domestic implements, textile machines, photo apparatus, radios, telephones, electric counters, etc. GN (9)

The Design and Construction of the St. Johns Bridge at Portland, Oregon. D. B. STEINMAN. *Journal Franklin Institute*, Vol. 214, Oct. 1932, pages 377-412. The St. Johns Bridge, spanning the Williamette River near its junction with the Columbia, is 4-laned and 9,000 ft. long, of which 5,000 ft, involved the construction of the approach. It is longest rope-strand suspension span in the world. Writer claims following novel and distinctive features in design: (1) use of tall arched concrete viaduct piers reinforced with structural steel frames, including highest reinforced concrete rigid-frame pier in world (163 ft. high); (2) first use of lofty arched main steel towers (400 ft. above mean low water) without conventional diagonal bracing; (3) checking of computed deflections and stresses in main towers of unusual design by precision laboratory tests on a scale elastic model; (4) first substitution of riveted Si-steel plates for eyebars usually employed in anchorage chairs; (5) development of a novel rocker cut from H-beams for expansion ends of truss spans. DTR (9)

Chromium-Nickel Castings in the Sulfite Industry. B. S. SUMMERS & J. D. CORFIELD. *Paper Trade Journal*, Vol. 93, Sept. 24, 1931, pages 37-38. Discussion of the structure of Fe-Ni-Cr alloys from standpoint of their mechanical properties and suitability for resistance to corrosion in sulphite mills. Cast parts are equal to bronze parts. Ha (9)

Steel Mesh for Iron-Concrete Structures. Tests with Lapped Joints. Steel Wire for Strapping Pillars. (Baustahlgewebe für den Eisenbetonbau. Preussische Zulassungsbedingungen. Versuche mit Stossverbindungen. Stahldraht als Säulenumschnürung.) W. PETRY. *Der Bauingenieur*, Vol. 13, Nov. 4, 1932, pages 556-561. Steel mesh described, is made of cold drawn steel wire, intersection points of single wires being spot welded. Specifications are given, comprehensive tests at bending loads are reported. Comparative tests on pillars reinforced with common commercial Fe wire and cold drawn steel wire show that wire with higher yield point, under otherwise comparable conditions, gives pillars with higher bearing capacity than wires with lower yield point. GN (9)

Copper Steel in the Construction of Boilers. (Les Aciers au Cuivre dans la Construction des Chaudières.) F. NEHL. *Cuivre et Laiton*, Vol. 5, Oct. 30, 1932, pages 473-476. Price of Cu steels is much lower than many special steels and as mechanical properties are better than those of C steels they have been used for boilers at high and highest pressures. Several Cu steels with 0.12-0.85% Cu were tested up to 600° C.; results are given in diagrams. Tensile strength, elastic limit and especially ratio of tensile strength to elastic limit are superior to ordinary C steel over whole temperature range. Data given refer mostly to Cu steels as they are normally manufactured in German plants. Ha (9)

HEAT TREATMENT (10)

Manufacture of High Strength Wire. ERNEST E. THUM. *Metal Progress*, Vol. 22, July 1932, pages 27-31. An outline of procedure followed in manufacture of heat treated wire for Mt. Hope and Detroit River bridges. Wire for these structures was rolled to .225″ rod from 2″ billets produced from killed basic, open-hearth steel of following analysis: C .80%, Mn .40%, Si 20%, S and P both less than .02%. Hot rolled rod was given 1 or 2 drafts to its finished diameter of .192″. Wire was treated by heating in Pb to 200° F. above critical temperature, cooling 300° F. in Pb, reheating to quenching temperature, and quenching in oil at 275° F. Tempering was in Pb at 800°. Physical tests indicated that wire was superior to cold drawn wire employed for bridge cables. WLC (10)

Steel and Its Heat Treatment. (Der Stahl und seine Wärmebehandlung.) H. STROHMAYR. *Eidgenössische Materialprüfungsanstalt*, Zurich, Report No. 64, 1932, pages 51-54. Considers annealing, hardening (including furnaces used), quenching media, drawing, case hardening and nitriding. GN (10)

Hardening (10a)

Methods and Special Equipment for Hardening and Testing of Ball Bearing Rings. (Verfahren und Sondereinrichtungen zum Härten und Prüfen von Kugellagerringen.) A. RIEBE. *Werkstattstechnik*, Vol. 25, Dec. 1931, pages 529-530. Rings are made of a Cr steel of 1.2 to 1.8% Cr, and 0.6 to 0.9% C.; P and S must not exceed 0.024%; higher figures hold good for larger rings. Hardening is done in closed muffles or salt baths, latter are preferable as formation of an oxide layer on surface of rings is effectively eliminated; hardening temperature is 810° to 835° C. Rings are quenched in an oil bath at 24° C. Testing for hardness by filing and Brinell method is described in detail. Ha (10a)

Importance of Temperature in Case Hardening in Mass Production. (Ueber die Bedeutung der Temperature bei der Einsatzhärtung von Massenteilen.) W. MELLE. *Werkstattstechnik*, Vol. 26, Oct. 1, 1932, pages 373-374. Relatively small differences of temperature within furnace have great influence upon depth of carburized zone in case hardening thin-walled objects. Local regulation within furnace muffle is necessary. RFV (10a)

A Study on the Electrochemical Potential in Relation to Heat Treatment and Aging of Duralumin. H. IMAI & M. HAGIYA. *Kinzoku no Kenkyu*, Japan, Dec. 1932, pages 530-538. Influence of heat treatment and aging on electrochemical potential of duralumin was studied. Potential existing between duralumin, and normal solution of KCl was measured against a normal calomel electrode at 20° C. Results show that by quenching at 510° C., duralumin becomes distinctly electronegative; that potential for quenched alloy remains unaltered for 10 days in aging; that by tempering at 100° C. it becomes slightly electropositive, and that by tempering at 200° C. its normal value is restored. Cu-Al and Mg-Si-Al alloys were also examined to confirm behavior of compound $CuAl_2$ and Mg_2 Si and it was found that no sign of precipitation of compounds nor change in super-saturated solid solution were observed during aging at room temperature. KT (10a)

Spring Leaf Bending and Hardening Machine for Locomotive and Car Springs. (Federblatt-Biege- und Härtemaschine für Lokomotiv- und Wagenfedern.) G. MODROW. *Verkehrstechnik*, Vol. 49, Feb. 15, 1932, page 92. Novel combined bending and hardening machine of the Locomotive Repair Shop Oppeln, Germany, is illustrated and described in detail and advantages pointed out. EF (10a)

Annealing (10b)

Electric Annealing of High-Speed Steels. WIRT S. SCOTT. *Iron Age*, Vol. 129, Feb. 11, 1932, pages 388-390. Annealing is by far most important heat treating operation in perfecting high-speed and super-high speed steels. Short length forged stock is annealed in muffle, packed in mica dust. Pit type electric furnace having a vertical crucible of cast Ni-Cr alloy is described. Coke, free of S, was found to be more economical than charcoal. Furnace is equipped with 2 thermocouples and 2-point pyrometer. 3 lbs. of steel produced/kw.-hr. VSP (10b)

Steel Wire Annealing. RICHARD SAXTON. *Metallurgia*, Vol. 7, Nov. 1932, pages 25-26. Brief description of commercial practice. JLG (10b)

Recovery Following Cold-Work. (Die Erholung von den Folgen der Kaltbearbeitung.) G. TAMMANN. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 220-223. Include discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. A review. Data on change in properties upon reheating cold-worked metals ("recovery"), Brinell hardness, electrical conductivity, magnetic susceptibility, thermoelectromotive force, for metals Cu, Ag, Au, Al, Fe, Ni, Pd, Pt are collected and compared. These changes occur at same temperature for Cu, Ag, and Au, but at different temperatures for other metals. Metals in chemically similar groups behave similarly with respect to recovery. In discussion O. Dahl states that while recovery temperatures for hardness and electrical conductivity are identical for pure Cu, addition of Sn in solid solution lowers recovery temperature for electrical conductivity, and difference in 2 recovery temperatures increases with increasing Sn-content. RFM (10b)

Heat Treatment of Cast Steel Parts. (Verbessern von Stahlgussteilen durch Glühen.) *Feuerungstechnik*, Vol. 20, May 1932, pages 77-78. Hard spots were eliminated by a heat treatment developed during several months of experimenting. Higher temperatures and much longer annealing time than customary are required: Slow heating to 1060° C.; average heating time is 4.5 min./mm. wall thickness and reduction of temperature down to 820° C. Pieces are taken out of furnace and cooled down in air to 420° C. Reheating to 850° C. for 3.4 min./mm. wall thickness. Cooling down in air to 400° C. and reheating to 650° C. After furnace is cooled to 300° C. objects can be taken out of furnace. EF (10b)

Heat-treatment of Steel Wires. *Metallurgia*, Vol. 7, Jan. 1933, pages 69-72. Describes commercial treatments, chiefly anneals, and effects of these treatments on structure. For cold-drawn wire it is desirable to produce a coarse grain size in final process anneal. JLG (10b)

How to Anneal Castings with Elimination of Internal Stresses. (Wie werden Gussteile spannungsfrei veredelt?) *Feuerungstechnik*, Vol. 20, May 1932, page 77. Castings are machined to + 1.5 mm. After 24 hours storage they are placed into a tight box filled with charcoal ash low in SiO_2. They are annealed at 340° C. for 6 hrs. and after cooling, machined to + 0.2 mm. by grinding if possible. They are submitted as above to 250° C. for 4 hrs., slowly cooled down during 8 hrs. and finish machined. EF (10b)

Gas Fired Unit Bright Anneals Copper Wire in Atmosphere of Steam. J. B. NEALEY. *American Gas Association Monthly*, Vol. 14, Aug. 1932, pages 336-338; *Fuels & Furnaces*, Vol. 10, July-Aug. 1932, pages 457-460; *Gas Age-Record*, Vol. 70, July 30, 1932, pages 111-112, 119. Describes furnace so designed that necessary heat is applied to work by convection of a heated fluid-steam which is chemically inert with respect to product. Work is annealed with absolute uniform ductility, free from discoloration and objectionable oxidation. It consists of an annealing chamber and gas-fired steam superheater built together, so arranged that a skid load of spools can be wheeled into and out of annealing chamber on a standard lift truck from floor level. A fan circulates steam at a high velocity through system. Steam is superheated by means of gas burners so arranged that products of combustion discharge to atmosphere. This makes it possible to maintain high temperatures without entraining a large volume of heat, and obtain substantially same temperature throughout entire mass in furnace. Temperature is raised to 525° F. under automatic temperature control and after annealing is completed burners are extinguished and water injected into steam passage, cooling the chamber and quenching the work, thus avoiding separate quench tanks. See also *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 71. VVK + Ha + RJC (10b)

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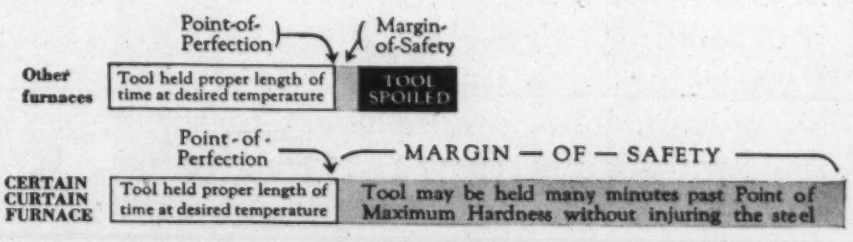

mal period at hardening temperature, sometimes as much as 30 minutes. But due to the perfected Certain Curtain control of Atmosphere, these tools have come through uninjured either as to scaling, decarburization or grain growth. In a Hayes Furnace, maximum hardness is obtained because the steel can be held ample time without fear of injury. You obtain MAXIMUM efficiency from your steel and ELIMINATE spoilage! Send for the interesting new Bulletin which shows effect of controlled furnace atmosphere in retarding grain growth even when usual margin of safety has been exceeded by several minutes—also other conclusive tests.

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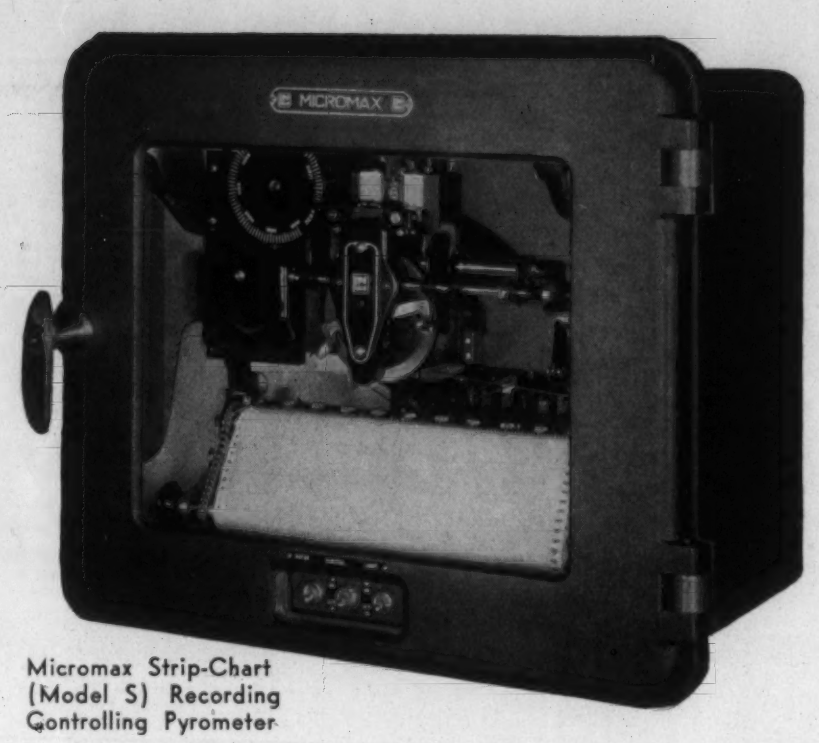

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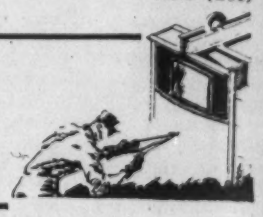
Case Hardening & Nitrogen Hardening (10c)

Nitriding Plant and Technique. H. H. Ashdown. *Metals & Alloys*, Vol. 3, Oct. 1932, pages 210-213. Outlines investigations of Westinghouse into nitriding process. Some results are presented and discussed including material for reaction chamber, composition of nitriding steel and length and temperature of cycle. Equipment produced by this company for nitriding is described. WLC (10c)

The Chemistry of Liquid Hardening Baths. George Barsky. *Transactions American Society for Steel Treating*, Vol. 20, Oct. 1932, pages 347-356. Author discusses chemistry of reactions between Na and Ca cyanide baths and surface of steel objects hardened from such molten salts. Effect of atmospheric oxidation in depleting cyanide content by formation of carbonate is discussed. Curves show C absorption with cyanide concentration. WLC (10c)

Brittleness of Low Carbon Steel. H. H. Bleakney. *Transactions American Society for Steel Treating*, Vol. 20, Oct. 1932, pages 321-346. Discusses structure of quenched hypoeutectoid steel and presents evidence that presence of martensite in martensite-ferrite structure is responsible for brittleness rather than large grain size. It is shown that conventional treatment of carburized parts develops only half potential shock resistance of core. To obtain full case hardness and core toughness author suggests quenching from pot at 1600° F., reheat to 1360° and hold for 5 minutes and remove to a medium of much higher temperature and quench after case has received sufficient superheat to insure full hardening quench in cold water. WLC (10c)

Is Your Heat Treating Plant Up-to-date?



This section digests the world's heat treating practices.

The Nitriding of Steel. (La nitrurazione dell'Acciaio.) F. Giolitti. Ulrico Hoepli, Milan, Italy. Paper 6½x9½ inches, 452 pages. Price 60 lire. This is another of the extremely well written, up-to-date summaries of metallurgical knowledge by eminent Italian authors that have been published by Hoepli within a year. Macchia's Chromium Plating and Guzzoni's Carbon and Alloy Steels were exceptionally good, and this work of Giolitti's is equally good. The metallography of the nitrides formed, the effect of the various elements in the steel for nitriding, and the properties obtained with a score of different analyses, are described. An especially interesting steel is one of 0.10% C, 2.55% Si, 1.40% Mn, 2.20% Ni, 0.50% Al and 3.90% Ti. By precipitation hardening occurring on heating to nitriding temperature, the core is brought up from 260 Firth to 575, the case showing 1000. The precautions necessary in the melting of steels for nitriding are briefly mentioned. The nitriding process itself, the equipment required, and the methods of control, are discussed. Much attention is given to hardness testing and the production of tough cases. Many interesting examples of nitrided parts which have shown far superior wear resistance to carburized or quenched and tempered steels are discussed and illustrated. Some laboratory tests on wear resistance are cited. The paper is good, the type large and the whole make-up attractive. The only criticism to be made is that, while credit is generally given to authors of articles from which data are taken, and some of these articles are listed in the bibliography, not all are, and the reader may have some difficulty in locating the original articles for more complete study. A few important articles on nitriding appearing late in 1932 contain information not included in the volume, but on the whole, it is surprisingly up-to-date. It is probably the most complete and coherent treatise on nitriding yet written. H. W. Gillett (10c)-B-

Denitriding of Nitrided Steel Surfaces. Part VIII of Nitriding of Steel and Iron Base Alloys. Wm. J. Merten. *Fuels & Furnaces*, Vol. 9, Dec. 1931, pages 1353-1356. Denitriding by heating in a bath of sodium-potassium chlorides (50/50 ratio) probably depends on the formation of gaseous NCl_3. Except in thin sections denitriding is never entirely complete because of continued diffusion of N inward but Brinell hardness below 250 can usually be obtained, which will permit machining. Nitrided Al-Mo steel should be in the bath up to 3 hours at about 1500° F. and should be cooled slowly in the bath nearly to its freezing point to prevent air hardening. Surface denitriding occurs in nitrided valves in internal combustion engines which use ethyl chloride compounded gasoline fuel. CMB (10c)

Quenching (10d)

Contribution to Study of Martensitic Quenching of Alloy Cast Irons. Marcel Ballay. *Transactions American Foundrymen's Association*, Vol. 3, May-June 1932, pages 1-15; abstract, *Foundry*, Vol. 60, May 1932, pages 36-37, 64, 66, 68. Various methods are available for obtaining hard, machinable cast irons, such as: irons relatively soft as cast, hardened by quenching and drawing; a more complex heat treatment; a simple draw of pieces as cast having a suitable composition; and a partial quench during cooling in the mold. For machinability the hardness must be obtained without excess cementite. The influence of Si, Cr, Ni, P, C, and Mn on the temperature of martensitic quench are illustrated by dilatometric curves. Curves are given to show hardness in relation to cooling speeds. Si raises the critical quenching rate. Ni, Cr and Mn lower it. Quenching cracks are avoided by utilizing irons quenched at low temperatures and employing slow rates of cooling. Such irons are had by decreasing Si content and adding Ni. A draw at a low temperature decreases brittleness and increases compression, shearing and transverse strength without materially reducing hardness. VSP + CHL (10d)

Drawing (10e)

On Drawing by Temper Colors. (Vom Anlassen nach Farben.) A. Jung. *Maschinenbau*, Vol. 11, Nov. 3, 1932, pages 452-454. Temper colors are not dependable where accurate drawing is required. They do not give security as to steel properties, especially not in regard to equality of these properties throughout whole piece. They are simply indications of an oxidizing process on surface which is regulated by time, temperature, mass of steel and its chemical and structural condition. RFV (10e)

Decomposition of Rustless Steels of 18-8% Cr-Ni Type. (La decomposizione degli acciaiinossidabili del tipo 18-8% Cromo e Nichel.) A. Reggiori. *La Metallurgia Italiana*, Vol. 24, Sept. 1932, pages 711-727. Samples studied contained 18% Cr and 8% Ni, but C was varied from 0.01-0.34%. They were heated for several hours at 1000° C, quenched in water, and then tempered at temperatures varying from 540°-930° C. They were then allowed to "decompose" by heating for 100 hours at 600°, 650°, 760°, and 870° C. Magnetic susceptibility, microstructure, and corrosion (in $CuSO_4$-H_2SO_4 solution, according to Strauss), of each sample was determined. Corrosion tests show that steels containing higher C content decompose more readily. Magnetic susceptibility also increases with increase C-content. Microphotographs show that with more than 0.06% C present, softening, or "decomposition" is accompanied by separation of C. There is no decomposition in low-C steels (0.01-0.04%). Tempering at 950°-980° C. is better than tempering at 1100°-1150°C., as is usually recommended, but as these very low C contents are difficult to attain, it is better to add instead, small amounts of Cu or Mo (2%), which prevents formation of magnetic phase entirely. Addition of Ti or V (Ti 0.5-0.8%, V 1.0-1.5%) prevents separation of carbides. AWC (10e)

Aging (10f)

Precipitation Hardening at 1500 Degrees Fahrenheit. Correspondence from ALBERT PORTEVIN. *Metal Progress,* Vol. 21, June 1932, pages 56-57. Reports on experiments to determine effect on hard alloys of reheating to 1550°-1750° F. following rapid cooling from 2400° F. as revealed by proportional limits in compression tests made on alloy A (30% Ni, 25% W) and alloy B (30% Ni and 30% W). The proportional limits were:

	A	B
As Cast	22,000	38,000
After 24 hrs. at 1550° testing at 1475°	48,000	53,000

WLC (10f)

Influence of Magnetic Fields on the Aging Process in Hardened Steel. (Einfluss magnetischer Felder auf die Alterungsvorgänge im gehärteten Stahl.) ALBRECHT KUSSMANN & HANS JOACHIM WIESTER. *Stahl und Eisen,* Vol. 52, Sept. 1932, pages 944-946. Hardened, unalloyed steel with 0.7-0.9% C was tested to find whether rotating in a magnetic field had any influence on Rockwell and pendulum hardness at room temperature or on annealing at 100° C. Contrary to results of E. G. Herbert, such an effect was not obtained. A curve is given showing change of hardness of a steel with 0.70% C, 0.15% Si and 0.59% Mn quenched from 780° C. on repeated single rotation in a magnetic field, according to Herbert. Tables give hardness of a 0.72% C steel on magnetic treatment at room temperature and of a 0.9% C steel after magnetic treatment at 100° C. MGL (10f)

Mechanical Aging of Mild Ingot Steel. (Beitrag zur Kenntnis der mechanischen Alterung weichen Flussstahles.) R. WALZEL. *Archiv für Eisenhüttenwesen,* Vol. 6, Dec. 1932, pages 257-262. Tendency to aging of mild, non-killed open-hearth steel was investigated by temperature at which steep drop in notch-toughness takes place due to cold-rolling. Aging tendency increases with decreasing amount of pig Fe in charge with increasing segregation and with increasing grain size. 15 references. Ha (10f)

Hot Structural Hardening of Iron-Nickel-Tungsten Alloys. (Durcissement Structural a Chaud des Alliages Fer-Nickel-Tungstene.) A. PORTEVIN, E. PRETET & H. JOLIVET. *L'Usine,* Vol. 41, Sept. 9, 1932, page 23. See "Structural Hardening at High Temperatures of the Alloys of Iron and Tungsten," *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 72. Ha (10f)

Hardening of Nickel and Chromium Austenites. (Le durcissement des austenites au chrome et au nickel.) P. CHEVENARD. *Revue du Nickel,* Vol. 3, July 1932, pages 91-95. Al is preferable to C for giving age hardening properties to high Ni-Cr steels. Typical composition is: C 0.30, Ni 35.20, Cr 9.90, Al 3.65. High Ni-Cr steels can be successfully nitrided. AH (10f)

On the Effect of Magnetic Treatment on the Age-Hardening of Quenched Steels and Alloys. Y. MATUYAMA. *Kinzoku no Kenkyu,* Japan, Sept. 1932, pages 367-377; *Science Reports Tohoku Imperial University,* Vol. 21, 1932, pages 242-255 (In English). Author re-examined results obtained by G. Herbert which reported that when a hardened steel was rotated in a strong magnetic field, its hardness, as measured by pendulum hardness tester, is increased; when a high speed steel, a C steel, or safety razor blade was subjected to one rotation in a magnetic field, its hardness first decreased then increased with lapse of time; a steel wire treated magnetically behaved in same way; maximum or minimum hardness can be maintained by magnetic stabilizing. Results obtained by present writer, using Vicker's hardness tester, showed no such periodic variations in hardness, writer measured hardness of duralumin, Armco iron, high speed steel and K.S. magnetic steel and found there was no such phenomenon as obtained by Herbert and that change of hardness which Herbert ascribed to magnetizing effect was nothing more than lack of uniformity of specimen and errors in hardness measurement. KT (10f)

Effect of Magnetic Treatment on Age-Hardening of Quenched Steels and Alloys. YOSIHARU MATUYAMA & E. G. HERBERT. *Metallurgia,* Vol. 7, Nov. 1932, pages 23-24. Matuyama's paper giving evidence that materials are not hardened by the magnetic treatment described by Herbert is abstracted. Letters from Herbert to *Metallurgia* and to the principal of Tohoku Imperial University are reported. Herbert claims that Matuyama's experiments were not properly performed, and that they would not be expected to bring about magnetic hardening. No data are given to prove that the Japanese worker is wrong. A note by the editor states that Herbert is continuing his studies on magnetic hardening, and that his recent studies confirm the earlier ones. 4 references. JLG (10f)

Malleableizing (10g)

Malleable Cast Iron. (Der Temperguss. Das Glühfrischen oder Tempern des Rohgusses.) E. SÖHNCHEN. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Jan. 8, 1933, pages 2-5. Discusses 2 points to increase efficiency of malleableizing process: (1) Shortening time of malleableizing, (2) increasing efficiency of furnace used. Process can be shortened by decreasing C content of raw casting. Of extreme importance is pretreatment of Fe. As investigations of Piwowarsky have shown, type of graphite can be improved by superheating and malleableizing process can then be decreased in case of a fine distribution of graphite. Of interest are findings of Sawamura, that malleable Fe, when rapidly cooled after casting, has a much shorter malleableizing time. Shortening malleableizing time also essentially depends on effect of other constituents on graphite formation. Effect of these elements is discussed at length. Next to pre-treatment and chemical composition malleableizing temperature is of importance for decreasing time. Modern malleableizing processes which take into consideration these points are described. Advantages of such rapid malleableizing processes are discussed. Costs of malleableizing also depend on furnaces used. Discusses how modern tunnel kilns and old-type chamber furnaces affect costs. GN (10g)

A New Phenomenon of the Graphitization of White Cast Iron and Its Application upon Black Heart Malleable Cast Iron Making (I). Influence of Mn. D. SAITO & K. NISHIHARA. *Suivokaishi,* Vol. 6, Feb. 25, 1931, 535-538. Influence of amount of surrounding air on graphitization of first stage of white cast Fe was studied by Sawamura, a few years ago (*Tetsu to Hagane,* Vol. 14, Sept. 25, 1928, pages 741-751). According to his results graphitization of cementite proceeds rapidly with increase of amount of surrounding air. It is also found that influence of amount of air decreases by addition of Mn and P in white cast Fe. Present investigation was carried out to determine relation between Mn content and annealing time to complete graphitization of first stage in white cast Fe. 11 kinds of white cast Fe containing 0.035 to 2.3% Mn, about 2.7% C and 1% Si were cast in green sand molds. Dilatation of specimens, 7 mm. thick and 80 mm. long, was measured during heating to 980° C. in closed air and in open air, and afterward microscopical examination was made. Stability of cementite in white cast Fe in closed air decreases with increasing Mn content to 0.4%, and annealing time to complete graphitization at 980° C. is reduced to a minimum. As Mn content increases further cementite becomes more stable both in closed and in open air. In annealing specimen containing 2.3% Mn at 980° C, for 30 hrs. in closed air, its graphitization does not take place completely and some free cementite remains undecomposed. Since white cast Fe containing 0.4% Mn graphitizes quickly and completely, it will be necessary to add this amount of Mn to black heart malleable cast Fe in practice. TS (10g)

Short-Cycle Malleableizing. HARRY W. HIGHRITER. *Transactions American Foundrymen's Association,* Vol. 3, May-June 1932, pages 72-87. Annealing is reduced either by increasing the rate of graphitization or by bringing the commercial annealing cycle closer to the minimum required for the particular iron being annealed. The various processes developed are described and comparative data given. CHL (10g)

JOINING OF METALS & ALLOYS (11)

Welding & Cutting (11c)

Electric Double Spot Welding. (Über elektrische Doppelpunktschweissung.) *Maschinenkonstrukteur-Betriebstechnik,* Vol. 66, Jan. 10, 1933, pages 6-8. Construction and mode of action of a new double spot welding machine are described embodying following features: (1) 2 electrodes are arranged side by side, (2) by using a guide electrodes are pressed with uniform pressure on parts to be welded, (3) short circuit upon starting welding is made only by upper sheet. According to temperature-resistance law current must pass to an increasing degree through lower sheet; a sound weld is thus formed, (4) space below electrodes is free, it merely contains a universal bearing to take up pressure; bulky pieces can thus be welded, (5) scale and coatings do not hinder since they burn out first on spot to be welded, thus guaranteeing sound welds. This offers large fields of application. GN (11c)

Planning a Welding Layout. (Die Planung einer Schweissanlage.) S. SANDELOWSKY. *Maschinenbau,* Vol. 11, Sept. 1, 1932, pages 359-361. Selecting a welding machine and accessories depends on existing circumstances and particular requirements. Operation and dependability of machine and welding method cannot be demonstrated easily and quickly. Author shows how to judge economic efficiency at lowest costs for 13 different welding methods in a particular case. 6 references. RFV (11c)

Igniting of Welding Torches. (Anzunden von Schweissbrennern.) E. SAUERBREI & W. SCHERUHN. *Autogene Metallbearbeitung,* Vol. 25, Nov. 15, 1932, pages 337-342. German Acetylene Committee has investigated conditions under which a welding torch can safely be ignited and prepared instructions so that no explosive mixture is present in any part of the acetylene apparatus of which several types of high and low pressure were included in the tests. Ha (11c)

Applications of Fusion Welding at 1932 Paris Show. (Les Applications de la Soudure Autogène vues à la Foire de Paris.) R. SALELLES. *Revue de la Soudure Autogène,* Vol. 24, June 1932, pages 2540-2544. Boilers, troughs, frames and wheels which, previously, would have been cast in foundry, wheel-barrows, gardening appliances, water tanks, pieces of furniture, tube refrigerators, etc., are described. FR (11c)

Have You a Joining Problem?

From January to July 1933 this section digested 399 articles on welding, cutting, soldering, brazing and riveting.

Age Hardening of Mild-Steel After Quenching and Its Effects on Fusion Welding. (Le Vieillissement des Aciers Doux après Trempe et ses Conséquences en Soudure Autogène.) D. SEFERIAN. *Revue de la Soudure Autogene,* Vol. 24, May 1932, pages 2514-2516. Author reviews results obtained by Seigle, in investigating age hardening of mild steel. It is generally accepted that mild steel of 40 kg./mm.^{2} tensile strength is but little affected by quenching and welders sometimes cool welded joints at temperatures as high as 700°-800° C. by dipping them in water. Therefore it is interesting to know how this treatment can affect behavior of welded materials. Results given show that aging treatment materially affects mechanical properties of mild steel even of Armco type. Conclusions of author concerning quenched welded joints are as follows: when steel has C content up to 0.2% it is common practice to quench joints because it was assumed this kind of steel was not responsive to quenching. But considering work of Seigle it is perhaps logical to explain failures occurring a certain time after welding, by effect of aging which imparts some brittleness to material 3 or 4 weeks following quenching treatment, whereas testing just after welding process had given quite good results. Those failures which were generally imputed to internal strains, corrosion or hidden defects could be thus explained. FR (11c)

Extensive Examination of the Quality of Electric-Weld Seams and the Abilities of Individual Welders. (Grosszahl-Untersuchung der Güte von Elektroschweissnähten und der Fähigkeiten von Schweissern.) ERNST POHL. *Stahl und Eisen,* Vol. 52, Sept. 22, 1932, pages 917-922. Includes discussion. Report 187, Committee on Materials of Verein deutscher Eisenhüttenleute. It has been recognized that quality of a weld depends to a large extent on ability of individual welder. In order to investigate this matter, 5 different welders were given same type and amount of work each week throughout a whole year. Welders themselves were unaware of investigation under way. Days selected for work were never those following Sundays, holidays, or pay days. Original material used in experiment was a normalized boiler plate, 6 m. long, 1.2 m. wide and 12 mm. thick. All welding was electric and welders themselves chose current and voltage. "Silesia-Universal" electrodes, dipped in lime were used throughout. Each finished seam was examined as to external appearance of weld, inclusions, cracks, etc. Then welded pieces were sampled and tested for Shore and Brinell hardness, tensile strength, elongation, deflection and bend angle. Frequency curves were drawn from results of each physical property for each welder and for summary of all the work. These freqeuency curves were then used to estimate ability of each welder. The deviation in values of each physical property, corresponding to work done by any welder, from most frequently-occurring values of all combined work, was used as a measuring rod of the welder's reliability. Quality of separate work done was computed in form of "Quality Numbers" for each welder. A relation between Shore or Brinell hardness and tensile strength of a welded seam was derived from summarized test data. By this derivation ratios of tensile strength to Shore hardness = 1.3 and tensile strength to Brinell hardness = 0.2 were obtained. These ratios signify that 85% of all test values were equal to or greater than calculated values. In event that writer's test method gives only approximate values for strength of an electric welded seam it still retains a real advantage, because of fact that it may be carried out in shortest time with only a small amount of work. This method may also be used to supplement Schmuckler's method for determining strength of weld seams. DTR (11c)

Advantages of Thyratron Control for Resistance Welding. WARREN C. HUTCHINS. *Journal American Welding Society,* Vol. 11, Oct. 1932, pages 19-23. Paper presented at Fall meeting of American Welding Society in Buffalo, Oct. 1932. Advantages of Thyratron control are: (1) flexibility, (2) exact duplication of time cycle, (3) low maintenance cost, (4) sturdiness, (5) large capacity range, (6) is noiseless, (7) is dependable. TEJ (11c)

High Frequency for Arc Welding. G. A. JOHNSTONE. *Electrical Engineering,* Vol. 52, Jan. 1933, pages 14-16. A 900-cycle double-core single-field arc welding generator, capable of supplying several different uses at once, and some test results are described. Among features of this generator are: multiple circuits for more than one operator; low open circuit; self-excitation or optional separate excitation from any d.c. source, rugged construction of rotor; no windings, no commutator, and no brush wear; and optional direction of rotation. WHB (11c)

Gas Cutting in the Composition of Machining Tools. (Das Autogenschneiden im Vorrichtungsbau.) K. SCHMELZER. *Feinmechanik und Präzision*, Vol. 41, Jan. 1933, pages 10-13. Examples of tools, jigs, clamps, templates, etc. are given. Besides ordinary soft Fe, C steel up to 2% C, Si steel up to 4% Si and 0.2% C, Mn steel with not more than 1.3% Mn, Cr steel with up to 1.5% Cr, Ni steel with up to 34% Ni, but less than 0.7% C and W steel with 10% W, 5% Ni and 0.8% C can be gas cut. Mo reduces cuttability. Ha (11c)

Stainless Steel. C. A. SCHARSCHU. *Journal American Welding Society*, Vol. 11, Nov. 1932, pages 34-36. Paper presented at May 24, 1932, New York Section Meeting, American Welding Society. Comprehensive discussion of manufacture, physical properties, and welding of various types of stainless steel. Author arranges these steels into 8 groups according to C, Cr and Ni content. TEJ (11c)

Testing of Fusion Welds in the Laboratory. L. W. SCHUSTER. *Welding Journal*, Vol. 29, Sept. 1932, pages 262-269; Oct. 1932, pages 294-298; Nov. 1932, pages 326-330. Paper read before members, Northwestern Branch, Institution of Welding Engineers, Sept. 28, 1932. Includes discussion. Complete discussion of laboratory fusion weld tests which include the following: Cold bend, hot bend and forge test, tensile tests on butt-welded test pieces, tensile test of all weld metal bars, Izod impact test, nick-bend test, Brinell test, repeated impact, fatigue tests and non-destructive tests. The author presents typical test data and discusses merits and shortcomings of various tests. TEJ (11c)

Some Practical Considerations of Oxy-Acetylene Welding. (Einige praktische Mitteilungen aus dem Azetylenschweissgebiet.) H. SCHUMACHER. *Azetylen in Wissenschaft und Industrie*, Vol. 35, Jan. 1932, pages 5-10. Paper retricts itself to possibilities which gas welding offers with reference to tube and pipe joining. Many instructive examples of rather complicated nature are taken from both ordinary house plumbing and industrial accomplishments relating to water conduits, steam, and gas pipe lines, heating and ventilating lines, etc. WH (11c)

Elevated Temperature Tests of Arc Welds in Russia. B. M. SHIMKIN. *Journal American Welding Society*, Vol. 11, Nov. 1932, page 31. Tensile tests of bare wire arc welds, mild steel base metal and all weld metal specimens show that between 68° and 932° F. arc welded specimens have about the same ultimate strength as base metal but a very poor ductility especially at 392° and 572° F. TEJ (11c)

Steel Skeleton of Cross Church in Osnabrück-Schinkel. A Welded Construction. (Das Stahlskelett der Kreuzkirche in Osnabrück-Schinkel. Eine geschweisste konstruktion.) H. SCHMUDDE. *Der Stahlbau*, Vol. 5, Dec. 23, 1932, pages 205-207. Principal supports and beams were welded; coated and bare electrodes were used. GN (11c)

The Occurrences of Shrinkage in the Electrically Welded Schlachthof Bridge in Dresden. (Die Schrumpferscheinungen an der elektrisch geschweissten Schlachthofbrücke in Dresden.) FRIEDRICH REINHOLD & FRITZ HELLER. *Bautechnik*, Vol. 10, Oct. 21, 1932, pages 613-617. St. 37 was used for this bridge which is all welded with exception of transverse girder joints. Longitudinal seams on main girders were automatically welded, transverse seams on these girders and all seams of transverse girders were welded by hand. Occurrences of shrinkage were investigated since conclusions can thus be drawn on magnitude and course of initial stresses in structure. Stress measurements were made with a Huggenberger tensometer. Transverse shrinkage of seams seems to be independent of lamella thickness and has a constant value. Girders were shortened by welding by about .9%. Initial stress in girder middle was determined to about 1100 kg./cm.^{2} Shrinkage stresses in structure are completely, or at least partially, compensated by plastic deformation. GN (11c)

Modern Welding and Cutting Requirements. (Neuzeitlicher Schmelzschweiss- und Schneidbedarf.) H. REININGER. *Maschinenbau*, Vol. 10, Sept. 17, 1931, pages 581-587. Review of progress in cutting and welding shown at last Leipzig fair. Describes new welding process ("Arcogen") which is characterized by a simultaneous welding with an acetylene flame and an electric arc. Advantages of both methods are combined. The Arcatom Process splits hydrogen atoms by an electric arc which unite again in weld developing high heat and protecting weld against any harmful atmospheric influences. Many types of new burners, cutting apparatus, gas developers and all accessories for welding are described. RFV (11c)

Electric Arc Welding Instead of Water Gas Welding. (Lichtbogenschweissung statt Wassergasschweissung.) OTTO REINECK & CARL MASSMANN. *Elektroschweissung*, Vol. 3, Nov. 1932, pages 213-214. Reineck remarks on paper by Massmann (*Elektroschweissung*, Vol. 3, May 1932, pages 96-98) that the statement that electric welding is by 40-60% cheaper than water gas welding is not correct. Some points are stressed which seem to favor use of water gas welding. GN (11c)

Method of Testing the Safety of Acetylene Constant Pressure Installations. (Verfahren zur Prüfung der Betriebssicherheit von Azetylen-Gleichdruckanlagen.) W. RIMARSKI & H. FRIEDRICH. *Azetylen in Wissenschaft und Industrie*, Vol. 35, Apr. 1932, pages 49-54; May 1932, pages 65-68. A testing equipment for inspecting commercial acetylene welding shops with regard to safe operation has been outlined in the Chemisch Technische Reichsanstalt Berlin. An explosive mixture of air-acetylene, which might occur under the most unfortunate circumstances, is electrically ignited. The flame and the explosion propagation are automatically recorded. Diagrams of numerous tests are included in the well illustrated paper which describes the testing equipment in great detail. WH (11c)

Distribution of Stresses in Weld Seams. (Über die Verteilung der Spannungen in Schweissnähten.) PILGRAM. *Elektroschweissung*, Vol. 3, Dec. 1932, pages 231-232. Theoretical considerations. GN (11c)

How to Treat the Welding Torch. (Wie behandle ich meinen Schweissbrenner?) O. RÖTHLIN. *Zeitschrift für Schweisstechnik*, Vol. 22, July 1932, pages 190-193. Detailed instructions are given for handling and maintaining a welding torch to insure proper functioning. EF (11c)

Repair of a Boiler by Arc Welding. (Ausbesserung eines Zweiflammrohrkessels durch Lichtbogenschweissung.) LJ. PETROVIC. *Elektroschweissung*, Vol. 3, Nov. 1932, pages 208-210. Describes in detail procedure followed in repairing by arc welding various parts of a boiler that were to be replaced owing to corrosion. Results of tensile tests on V- and X-welds as well as data on consumption of electrodes and electric energy are given. GN (11c)

Electrical Spotwelding Machines of Large Output. (Elektrische Punktschweissmaschinengrosser Leistung.) E. REITSCH. *AEG Mitteilungen*, No. 10, Oct. 1932, pages 318-321. Constructive details are described of several large single and multiple spot welding machines with a maximum output of 70-100 kva. Ha (11c)

Some Interesting Examples of Welded Frames and Constructions. (Quelques Exemples Intéressants de Bâtis et de Constructions Soudés.) M. SALELLES. *Bulletin de la Société des Ingénieurs Soudeurs*, Vol. 3, Jan.-Feb. 1932, pages 525-547. Lecture before Société des Ingénieurs Soudeurs. Welded structures described are: machine bases, electric motor stators and rotors, collector drums, transformer magnetic circuits, transformer cases, etc. Tables give seams for different types of joints. Jigs for controlling size of seams are also described. FR (11c)

Electrically Welded Plate Girders for a Railroad Bridge in Bavaria. (Elektrisch geschweisste Blechträger für eine Eisenbahnbrücke in Bayern.) ASSEL. *Elektroschweissung*, Vol. 3, Nov. 1932, page 210. As contrasted with a corresponding riveted construction 30% in weight could be saved in described plate girder, having the upper boom in the form of a broken line. GN (11c)

Electrically Welded Steel Building Structure. (Elektrisch geschweisster Stahlskelettbau.) STEFAN BRYLA. *Die Elektroschweissung*, Vol. 4, Jan. 1933, pages 13-15. Discussion of welding work done in erecting described. On testing welds proved to be of high quality. GN (11c)

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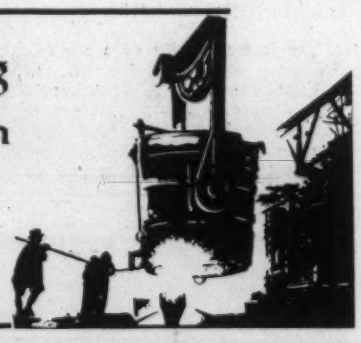
WORKING OF METALS & ALLOYS (12)
Melting & Refining (12a)

Precautions in Electric Melting of Aluminum. (Was ist beim elektrischen Schmelzen von Aluminium zu beachten?) E. Fr. Russ. *Metallwirtschaft,* Vol. 11, Oct. 28, 1932, pages 593-594. In melting Al and its alloys it is most important not to overheat metal above 725° C. In electric furnaces danger is reduced through close control and neutral or reducing atmosphere which reduces effect of overheating. For melting small quantities pot furnaces heated by resistance units are used, generally with Fe pots. Current consumption is 50 to 65 kw.hr./100 kg.Al. Pot is first heated to a red heat, then metal is charged and heat of pot should be sufficient to melt some of it immediately. For melting 500 to 2000 kg. of Al electric open hearth furnaces with refractory linings are recommended. They are preheated to 800° C. before charging. It is useless to add a flux to bath except just before pouring to remove oxides. Pouring should be done quickly from a low height and without interrupting stream of metal. These furnaces require 400 to 500 kw.hr./ton of metal. CEM (12a)

Open Hearth Practice in German Works and Reconstruction of Open Hearth Shops in USSR. P. Ravdell. *Domez,* No. 12, 1931, pages 1-10. (In Russian.) Detailed description of open hearth practice in plant in Ruhr district having tilting furnaces. A parallel is drawn between tilting and stationary furnaces regarding the possibility of using tilting practice for stationary furnaces. (12a)

Electric Steel for Castings. Henry D. Phillips. *Metals & Alloys,* Vol. 3, Oct. 1932, pages 214-219, 232. Differences in problems of steel ingot and steel casting producers are presented. 3 classes of inclusions, oxides, sulphides, and oxide-sulphides are discussed. 6 sources of inclusions in acid electric steel are given, non-metallic matter on or in the charge, non-metallic matter formed upon use of recarburizer, improper working of heat with ore, formation of non-metallics from final additions of Si, Mn, Ti, Zr, etc., non-metallic matter from faulty brick work or spout, cutting of mold materials. O_2 and S introduced from charge or furnace atmosphere are fundamental sources while slag, refractories, and mold are subordinate sources of inclusions. Types of inclusions which are most serious to properties of castings, solubility of inclusion forming materials in liquid and solid metal, as well as lack of fluidity of "over reduced metal" are discussed. Fluidity and methods of determining at furnace are discussed. Effect of various elements and their optimum proportions are discussed. 2 methods of steel making are described and discussed, one where charge is designed to melt down at 0.35% C which is then gradually reduced with proper additions to slag converging temperature of slag and metal on same point and tapping with addition of finals. An alternate method of running the C down below point desired and recarburizing with wash metal is discussed. Latter method produces a boil on addition of wash metal which aids in elimination of non-metallic matter entrapped in bath. Use of Al is discussed and its bad effect upon condition of sulphides is described. Its use should be limited to that necessary to take care of mold gases. 10 references. WLC (12a)

Are You Keeping Up-to-date on Modern Melting Practice?
The Abstracts tell what is going on.



Manufacture of Axle and Spring Steels in Germany. P. Ravdell. *Domez,* No. 7, 1932, pages 39-48. (In Russian.) Description of German open hearth plant and of its steel making methods, including amounts of gas used in different stages of heat, teeming practice and mold preparation, sizes of ingot molds and alloys used for deoxidation and alloying purposes. Logs of several heats are given in detail. (12a)

Experimental Production of Cr-W Steel in a Basic Open Hearth Furnace. A. Shevtshenko. *Domez,* No. 6, 1932, pages 47-49. 2 experimental heats made in 5 ton basic open hearth furnace showed that it is possible to make in it C-W steels. Fe-W is added when the C content of bath is about 0.2% higher than desired final content which is one hour before tapping. Stirring with wooden rabbles is quite helpful. Bath is allowed to boil until C is just under desired amount, is deoxidized with Fe-Si and desired amount of Fe-Cr is added to it after which heat is tapped. This procedure involves loss of more than 40% of W introduced and about 30% of Cr added. Long time interval between Fe-W addition and tapping is important. (12a)

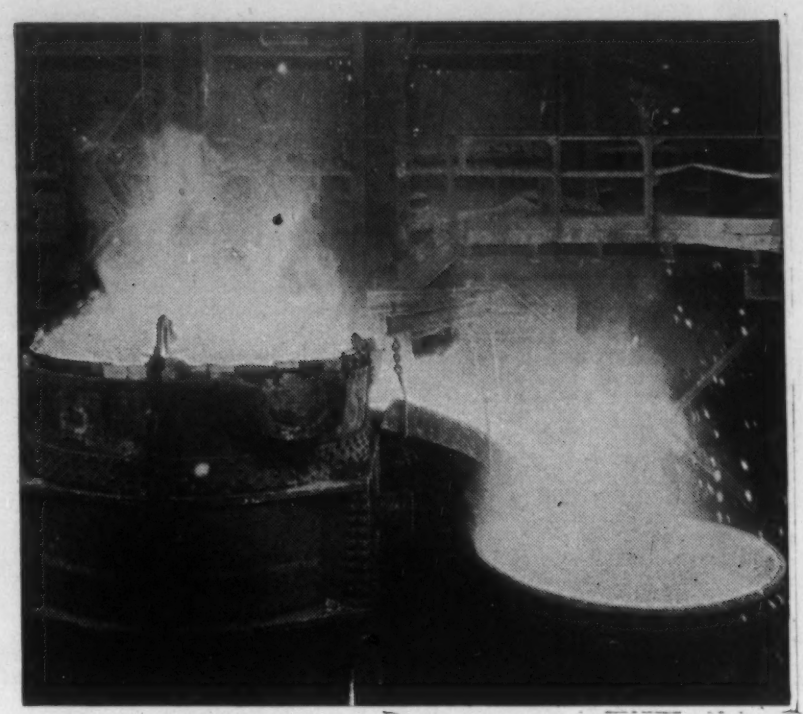
Production of Malleable in the Cupola from High Scrap Charges. (Die Herstellung von Kupolofentemperguss aus schrottreichen Gattierungen ohne Temperroheisen.) Rudolf Stotz & Springkämper. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 25, 1932, pages 510-514. Stotz replies to former paper of Springkämper, *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, June 22, 1932, pages 254-257. He maintains the practicality of his new scrap melting method whereas Springkämper refutes its efficiency. GN (12a)

Residual Metals in Open-Hearth Steel. Clyde E. Williams & John D. Sullivan. *Metals & Alloys,* Vol. 3, Nov. 1932, pages 240-245. Presents preliminary data in a study of effect of use of automobile scrap on residual content of basic open-hearth steel in such elements as Ni, Sn, Cu and Cr. Increased scrap ratio with increased use of automobile scrap appears to increase amounts of such elements. WLC (12a)

On the Nature of Motion of Metal in Induction Furnaces with a Trough. B. M. Strunsky. *Domez,* No. 1-2, 1932, pages 34-40. (In Russian.) Based on data, mechanism of the motion observed in induction furnaces is analyzed. For a rational construction both motion produced by magnetic flux and by thermal effect must be considered. (12a)

Experimental Melting of High Speed Steel without the Oxidation Period. S. I. Stupar. *Domez,* No. 3, 1932, pages 30-43. (In Russian.) Several regular high speed steel heats are minutely described. An electric furnace with rotating arc and capacity of 150 kg. was used. One set of heats was run using usual double slag process, rest without first oxidizing period. From economical standpoint a comparison between 2 types of operation could not be made. Quality of steel made under one slag was entirely satisfactory. (12a)

The Recovery of Copper from Foundry Refuse. (Die Rückgewinnung von Kupfer aus Abfällen in Giessereibetrieben.) Friedrich Vogel. *Metall und Erz,* Vol. 29, Oct. 1932, pages 411-417. In the smelting processes it is immaterial what the % Cu in the refuse is. As Cu has an affinity for S, scrap containing high % of Cu is melted with it to separate the Cu. Of the wet methods the Hänsel CuCl electrolysis is better than the sulphate method, but it is not yet used as much. For materials of low metal content the electrolytic method is commercially possible only on a large scale. Another method is to oxidize the brass, dissolve it in HCl, reduce $CuCl_2$ to CuCl and treat with BaS to form Cu_2S. However, for the average foundry only dry metallurgical processes are commercially economical. 10 references. CEM (12a)



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Melting and Casting of Nickel and Nickel Bearing Non-Ferrous Alloys. (Schmelzen und Giessen von Nickel und nickelhaltigen Nichteisenmetall-Legierungen.) B. TRAUTMANN. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Jan. 8, 1933, pages 11-13. Discusses conditions of working this metal and its alloys, melting equipment, melting process and casting of pure Ni and Monel metal. Effect of impurities of Ni on melting and mechanical properties is discussed. Similarly conditions for properly working Cu-Ni alloys with less than 50% Ni, German silver and bronzes are considered. GN (12a)

Contribution to the Question of Mixing High Grade Cast Iron. (Beitrag zur Frage der Gattierung hochwertigen Gusseisens.) UHLITZSCH. *Die Giesserei,* Vol. 19, Sept. 30, 1932, pages 393-396. Methods and diagrams of Osann and Maurer are enlarged and modified and it is shown how by their use contents of C, Si and P for any desired wall thickness of a casting must be selected in order to obtain an absolutely eutectic, pearlitic structure. Formulas previously given for calculation of tensile strength of cast Fe from its chemical composition were checked and found to be correct. Ha (12a)

How to Prolong the Service Life of Melting Pots for Lead, Tin, Zinc or White Metals. (Wie verlängert man die Lebensdauer der Schmelzkessel für Blei, Zinn, Zink oder Weissmetalle?) *Brennstoff und Wärmewirtschaft,* Vol. 14, Aug. 1932, pages 139-140. Greatest danger of destroying a melting kettle prevails on remelting the solidified content. The metal at the bottom melts first and may blow off the latter. The writer suggests inserting an ascending pipe, i.e. a ground or polished steel cone, greased with graphite, shortly before solidification. Before remelting cone is removed by Fe bars inserted through holes at cone top. First molten metal might also ascend along the kettle walls if it is only about 1/3 filled. An ideal solution is secured by electric heating. The heating elements are subdivided into wall and bottom heating units. In case of coal, oil or gas firing, a removable auxiliary heating coil may be used which is temporarily put into a case welded onto inside of melting pot. A sudden temperature change due to cold draft might result in cracking. Great temperature differences are very harmful. Use of slowly burning lignite briquettes is recommended. Temperature of coke should be moderated by lignite briquettes and the pot should be shielded by refractory plates in case of oil firing. In order to prevent unnecessary high temperatures and waste of fuel, immersion pyrometers should be employed which automatically control fuel supply and keep bath at ± 5° C. of desired temperature. EF (12a)

Dressing of Lead Ashes and other Metal Scrap. (Die Aufbereitung von Bleiasche und anderen Metallabfällen.) *Maschinenkonstrukteur-Betriebstechnik,* Vol. 65, Nov. 10, 1932, pages 137-138. Simple melting devices are considered in which waste metals and metallic ashes can be economically recovered in small plants. Rotary furnaces are advisable for large melts. To attain best quantitative and qualitative results all waste metal should be freed from coarse impurities before melting. Temperature supervision in melting is stressed. GN (12a)

Investigations into Metallurgical Course of Thomas Process. (Untersuchungen über den metallurgischen Verlauf des Thomasverfahrens.) FRIED. KOERBER & G. THANHEISER. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 14, 1932, pages 205-219. Investigation aims to clarify metallurgical phenomena going on in Thomas process from beginning of blowing to pouring of ingots. In order to do this samples of metal and slag were taken very often and cooled as rapidly as possible so that no reaction could take place. Analysis of samples gave change of concentration of accompanying elements during blowing. It was found that equilibrium of Mn depends on temperature; distribution of O between molten metal and slag permits conclusion that metal is richer in O during blowing than corresponds to equilibrium between bath and slag. Melts which were deoxidized with red-hot Fe-Mn in converter showed the lowest, with cold Fe-Mn highest, amount of O. A particularly great decrease in total O-content was found during solidification of ingot in mold; this was explained in deoxidation diagram by precipitation of deoxidation products and strong development of gases during solidification. Content of O varies greatly in different parts of ingot; highest values were found at bottom of ingot; samples made of this part had lowest elastic limit and tensile strength, and highest elongation and reduction of area. Tests are reproduced in detail. 14 references. Ha (12a)

Relations Between Iron Containing Manganese and Slag, Consisting Almost Exclusively of Manganous Oxide and Ferrous Oxide. (Ueber die Beziehungen zwischen manganhaltigem Eisen und Schlacken, die fest nur aus Manganoxydul und Eisenoxydul bestehen.) F. KOERBER & W. OELSEN. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 13, 1932, pages 181-204. Equilibrium conditions between Mn-containing Fe and slags of mostly ferrous and manganous oxide are determined between 1520° and 1950° C. and constants of equilibrium between metal bath and slag calculated; values correspond in general to curve derived from the mass law. Diagrams of state are developed and zone of segregation of liquid and crystallized deoxidation products from metal bath determined. Nature of inclusions is investigated. All results are shown in tables and charts. Ha (12a)

Treatment of Aluminum Turnings with Salt Fluxes. (Behandlung von Aluminiumspänen mit Salzschlacken.) W. LEITGEBEL. *Metallwirtschaft,* Vol. 11, Dec. 23, 1932, pages 699-700. In remelting Al turnings temperature must be kept low to prevent gas absorption and salts used for fluxes must also have a low melting point. System KCl-NaF was investigated and eutectic melting point was found to be 653° C. with a composition of 81% KCl and 19% NaF. Ternary mixture of 12% NaF, 35 to 45% NaCl, balance KCl begins to crystallize at 607° C. Melting point of NaCl is lowered 10° by the addition of 5% CaF_2 and melting point of ternary mixture is lowered to 604° C. by .5% CaF_2. 2 references. CEM (12a)

Induction Melting of Alloy Steels. M. H. MACKUSICK. *Electrical World,* Vol. 100, July 30, 1932, pages 146-150. Construction and operating details of the Ajax-Northrup high-frequency induction furnace are outlined. The theory of induction furnace operation is discussed. Sizes up to 8000 lb. capacity have been built and designers foresee no inherent difficulties for the construction of larger furnaces. This type of melting is especially applicable to alloy steels since the alloy loss is almost negligible. CBJ (12a)

The Use of Acid Electric Furnaces in Steel Foundries. (Applications en fonderie d'acier des fours électriques acides.) R. LEMOINE. *Journal du Four Electrique,* Vol. 41, Oct. 1932, pages 367-371. Acid electric furnace steel has a much better fluidity at same temperatures than basic steel. This strongly recommends it for foundry practice particularly because acid furnace operations speed making of steel very considerably, reduce amount of current by about 200 kwh./ton and diminish cost of refractories used. When price difference for low P scrap is not excessive, acid furnaces are to be strongly recommended. A typical method for running them is given. JDG (12a)

Basic Open-Hearth Furnace Charges. LEWIS B. LINDEMUTH. *Iron Age,* Vol. 130, Aug. 18, 1932, pages 250-252, adv. sec. page 20. System for charging open-hearth furnaces, arrived at empirically, increases tonnage and yield, eliminates poor quality steel and furnishes a means for determining relative value of different grades of scrap. Gives figures taken from actual operating tables and collection of data, making application of similar procedure a comparatively simple matter. Includes a chart giving correction coefficient to ascertain amount of pig Fe to be used to correct for actual variations in Si content of Fe. Tabulates relations between amounts of pig Fe to go with different amounts of different grades of scrap. VSP (12a)

Preparing Aluminum for the Market. J. B. NEALEY. *Metals & Alloys,* Vol. 3, July 1932, pages 166-167. Author describes gas fired furnaces used at Cleveland plant of Aluminum Co. of America for refining pig Al from the reduction pots and electrolytic cells. This remelting accomplishes removal of non-metallic impurities introduced from the electrolyte and the molten metal is alloyed when such additions are desired and cast into ingots suitable for the various methods of fabrication. WLC (12a)

Casting & Solidification (12b)

Pressure Casting Machine. (Machine à mouler sous pression.) *Journal du Four Electrique,* Vol. 41, Oct. 1932, page 371. At last Foundry Exposition Josef Polak from Prague demonstrated a die casting machine for brass, Zn and light alloys where the metal in a mushy state is driven into dies under a pressure of 1000 kg./cm.^{2}. Pieces as heavy as 5 kg. can be made of brass. Machine is driven by a 10 kw. motor and its normal speed is 3-4 castings a minute, though this number can be increased to 8-10 castings for brass when wear of dies is of a secondary importance. Slow injection of metal into dies diminishes resistance of friction and pressure increases progressively. Machine is worked by means of a hydraulic press, and for simple castings requires one man to operate it. For more complicated, 2 are needed. Metal is heated in a separate furnace and is poured into machine with a spoon. JDG (12b)

Durability of Ingot Molds. (Die Haltbarkeit von Stahlwerkskokillen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Nov. 27, 1932, page 635. Abstract of paper by J. Durand & J. Verney before International Foundry Congress, Sept. 1932, Paris. To increase durability of molds it is of prime importance to use a cast Fe of high temperature stability. Since Ni and Cr decrease tendency to growing, molds should contain about .5% Ni and .5% Cr. Practical tests with such molds proved an increased durability. GN (12b)

Device for Casting accurate to Dimensions Bearings of 90 mm. Diameter provided with Lubricating Grooves. (Genauigessvorrichtung für Lagerschalen von 90 mm. Bohrung mit eingegossenen Ölauten.) KURT HEGEWALD. *Die Werkzeugmaschine,* Vol. 37, Jan. 15, 1933, page 10. Device described in detail with 3 illustrations. GN (12b)

Brass Press Casting Method. (Das Messingpressgussverfahren.) W. BRUNKOW. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 25, 1932, page 516. Differences between die casting and press casting of brass are first dealt with. Most important types of machinery used and their mode of working are considered. All brasses with a large freezing range are suitable for press casting. Results of tests on properties of sand and press cast 58% Cu brass are tabulated. GN (12b)

The New RWR Casting Method of the Vereinigte Aluminiumwerke A.-G. (Das neue RWR-Giessverfahren der Vereinigten Aluminiumwerke A.-G.) KESSNER. *Metallwirtschaft,* Vol. 11, Oct. 21, 1932, pages 583-584. The object of this method of casting Al ingots is to separate completely the casting and solidification periods, so that the mold is completely filled before any part of the metal solidifies, and then to start cooling from one side only. In this way impurities and gases have a chance to rise to the top instead of being trapped. This is accomplished by placing electric heating units around the 4 sides and bottom of the ingot mold which keep it hot during casting. After filling the mold a Cu plate is clamped on top and the mold is turned over. Cold water is then sprayed against the Cu plate which causes the Al to solidify from the bottom toward the top. By vibrating the mold at a definite amplitude and frequency during solidification the dissolved gases are eliminated without the use of additions of Ti or similar materials. Ingots of 50 kg. can be cast in 22 to 25 minutes by this method. CEM (12b)

The Heterogeneity of a Sand-Cast Steel Ingot. A. KRIZ. *Iron & Coal Trades Review,* Vol. 124, May 6, 1932, pages 747-749; *Foundry Trade Journal,* Vol. 46, May 19, 1932, pages 310-311, 316; *Iron & Steel Industry & British Foundryman,* Vol. 5, May 1932, pages 293-298; June 1932, pages 333-335; *Engineer,* Vol. 153, May 20, 1932, pages 549-550; *Engineering,* Vol. 133, May 20, 1932, pages 596, 608-609. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 43. LFM + CHL + OWE + Ha (12b)

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Centrifugal Casting of Non-Ferrous Metals. (Schleuderguss aus Nichteisenmetallen.) K. Hanser. *Mitteilungen aus den Forschungsanstalten des GHH-Konzerns,* Vol. 2, Jan. 1933, pages 90-95. Advantages of centrifugal casting of steel and Fe were extended to non-ferrous metals although in this case not a quantity production was required but rather individual pieces. Tests made with special brasses with a Cu-content of 54-62% and, in addition to Zn, Mn, Al and Fe totalling 7% resulted in a greatly superior material as the following tabulation shows:

		Special Brass No. I	II	III
Tensile strength	Centrifugal casting	37.8	49.0	72.3
kg./mm.^{2}	Sand casting	32.0	40.4	61.4
Elongation %	Centrifugal casting	40.2	29.0	13.3
	Sand casting	33.3	22.0	8.5
Brinell hardness	Centrifugal casting	105	138	175
	Sand casting	91	115	150

Arrangement of the molds, lining with Cu to avoid porous surfaces, and several castings up to 7 m. length are described and illustrated. Ha (12b)

Magnesite Refractory Nozzles for Teeming of Steel. P. P. Budnikov. *Domez,* No. 6, 1932, page 36. With larger heats and special steels usual fire brick nozzles are not satisfactory. Magnesite nozzles are used abroad with great success. Brief description of their manufacture is given and attention is called to possibility of utilization of Russian Ural deposits which are large and of exceptional quality. (12b)

Mechanism of Inverse Segregation. Correspondence from Kotaro Honda. *Metal Progress,* Vol. 22, July 1932, pages 52-53. Gives conclusions reached in a study of inverse segregation occurring in Sn-Zn alloys. Evidence indicates that phenomenon is connected with very rapid freezing, in an undercooled condition, of alloys with fairly large solidifying range, and is caused by a movement of melt from center towards outer portions so as to feed volume shrinkage (6.5% for Zn) due to crystallization there of primary constituent. WLC (12b)

Shop Method for Determining Volume Changes in Cast Iron During Casting. E. J. Ash & C. M. Saeger, Jr. *Transactions American Foundrymen's Association,* Vol. 3, July-Aug. 1932, pages 188-200. See "Volume Changes of Cast Irons during Casting," *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 17. CHL (12b)

Normal and Reversed Ingot Segregation of Al-Cu Alloys. (Ueber die normale und umgekehrte Blockseigerung von Al-Cu-Legierungen.) Hans Bohner. *Metallwirtschaft,* Vol. 11, Aug. 5, 1932, pages 437-438. See *Metals & Alloys,* Vol. 4, Jan. 1933, page MA 17. CEM (12b)

On Chemical Composition of Ingot Molds. (Ueber die chemische Zusammensetzung von Kokillen zum Giessen von Stahlblöcken.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Nov. 27, 1932, pages 473-474. Paper particularly refers to effect of chemical composition on durability of molds. Basic open hearth steel molds with .32-.40% C possess longest durability. In cast Fe molds the Mn content is of great importance; molds with a Mn content of 1.95% gave highest durability, 180 castings till failure as against 46 in a mold with but .34% Mn. It is shown that S contents above .15% are detrimental to durability. Whether Cr is to be used for increasing the durability depends on economic considerations. GN (12b)

Casting of Iron in the Near Future in Connection with the Success of Chill Casting. M. Zaoustinski. *Vestnik Metallopromishlennosti, (Metal Industry Herald),* Vol. 12, June 1932, pages 43-48; July 1932, pages 45-51. (In Russian.) A description of chill casting methods used for production of Fe castings. The paper is based on American practice, but the sources used are not given. (12b)

Causes and Prevention of Pinholes in Aluminum Castings. D. Hanson & I. G. Slater. *Foundry,* Vol. 60, Feb. 15, 1932, pages 21-24. See "Unsoundness in Aluminum Sand-Castings," *Metals & Alloys,* Vol. 2, Dec. 1931, page 312. VSP (12b)

Fluidity and Pourability of the Ultralight Alloys. (Fluidita e colabilita delle leghe ultraleggere.) L. Losana. *Alluminio,* Vol. 1, July-Aug. 1932, pages 237-243. Variation in fluidity of alloys containing 82.77-91.83% Mg, 10.71-4.88% Al, 5.76-2.51% Zn, with about 0.25% Si, and 0.35% Fe, as a function of composition and temperature has been studied. As a basis of comparison, in fluidity measurements, pure Al (99.68%) at 700° C. was used. Fluidity of molten alloy was measured by speed of rotation of a rotor suspended in fluid, and connected through to a pendulum. Pendulum was started swinging from a certain angle, and time required to dampen vibration of pendulum to ½ amplitude, was used as a measure of fluidity. Fluidity of alloys high in Mg, increases markedly with temperature, up to 700°-800° C., and then rises more slowly until it is practically linear. Those higher in Al, show an almost linear rise from the start. For measurement of pourability, a large receptacle provided with a narrow orifice is used, so that a ribbon of alloy may be extruded without lowering level of molten alloy appreciably. Length of ribbon extruded is a measure of pourability. Measurements were made from 700°-1000° C. Alloys high in Mg show a great increase in pourability from 700°-800° C., increases more slowly to 900° C. and then shows a slight drop. This is due to oxidation, as in an atmosphere free from O_2, all the alloys show an almost linear increase in pourability with increasing temperature. An "index of pour" is defined as % of a certain element which when added to the basic element at a given temperature will cause an increase of 1 cm. in the length of the ribbon extruded. The "coefficient of pourability" is also defined as the % of one element which when added to the basic metal, will give the same increment in pour as the addition of 1% of the other metal taken as a unit. AWC (12b)

Casting of Some Aluminum Alloys and a Trial of Their Modification. W. Loskiewicz & E. Perchorowicz. *Przeglad Techniczny,* Vol. 70, Jan. 1931, pages 53-62, 77-81; Feb. 1931, pages 113-118, 141-145. (In Polish.) Theory of undercooling is developed in order to explain action of modifier influencing number of nuclei and velocity of crystallization. Al alloys with 8.2% and 12.4% Cu, modified by Pb, Na, and Cd possess a small grained structure but do not change mechanical properties as compared with non modified alloys. Al alloys with 4.1% Cu, 10.23% Zn and 0.39% Si are very much influenced by addition of 0.1-0.25% Cd as a modifier. Last alloy cast in Fe molds at 680° C. after modifying by 0.1% Cd at 650° C., indicated an increase of tensile strength from 13.33 to 16.58 kg./mm.^{2}, and elongation from 3.21% to 4.79%. Sand castings of same alloy modified by 0.1% Cd at 700° C. and cast at 720° C. showed an increase in tensile strength from 13.85 to 15.26 kg./mm.^{2}, and the elongation from 5.04 to 6.48%. Period between modifying and casting was determined in 5-10 min. 57 references. ZJ (12b)

Stopper Heads and Nozzles for Teeming Ladles. P. P. Budnikow & S. P. Loginow. *Domez,* No. 6, 1932, pages 30-35. (In Russian.) Review of mechanism of nozzle and stopper head wear during teeming is followed by description of some experimental work. Stopper heads made of ground fire brick and Russian refractory clays and burnt lightly fail by washing away from softened clay of firebrick particles, particularly when they are larger than 1.5 mm. When the nozzles are burned to partial fusion they spall too badly. Mixes made with Russian clays and firebrick ground to 0.5 and 1.0 mm. made into stopper heads and nozzles showed that smaller firebrick size is advantageous. Burning at Seger cone No. 12 was not sufficient for the nozzles. (12b)

The Castability of Alloys and Its Relation to the Solidification Interval. (La coulabilité des alliages. Relation avec l'intervalle de solidification.) A. Portevin & P. Bastien. *La Fonderie Belge,* Vol. 2, June 1932, page 111. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 44. FR (12b)

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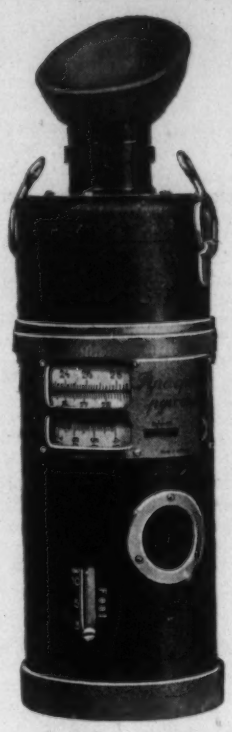

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Rolling (12c)

A Method for the Design of Blooming Mill Rolls. A. P. Chekmarev. *Domez*, No. 3, 1932, pages 9-22. (In Russian.) With usual method of pass design capacity of motor is far from being fully utilized. Even when work delivered to mill approximately corresponds to rated capacity, it is obtained at expense of heavy overloads and running idle between passes. A method is proposed in which by taking account of time between rolls and power of motor, ingots are broken down into billets in a blooming mill with the same expenditure of energy for each pass. Calculation of passes starts from last one and is made clear by charts. (12c)

Aluminium Sheet Production. Part XIV.—Cold-Rolling Mills. Robert J. Anderson. *Metallurgia*, Vol. 6, Sept. 1932, pages 163-164, 168; Oct. 1932, pages 185-186; Vol. 7, Nov. 1932, pages 11-13; Dec. 1932, pages 43-45. Detailed descriptions of many types of mills used for cold rolling. JLG (12c)

Manufacture of Sheet Steel in the United States. (Om tillverkning av tunnplat i U. S. A.) R. Byman. *Jernkontorets Annaler*, Vol. 114, Oct. 1932, pages 502-513. Description of American practice. HCD (12c)

Rolling Mill Bearings and Their Production. (Walzenlager und ihre Herstellung.) Erich Becker. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 30, 1932, pages 439-440; Nov. 13, 1932, pages 458-459. Durability of rolling mill bearings depends not only on operating conditions and proper composition of alloy but to a large extent on methods used in producing them. Careful selection of charge, careful melting and proper molding are necessary since such bearings are generally used as cast. When these conditions are observed in foundry work failure is due to operating conditions and detrimental treatment in rolling mill. It is particularly stressed that gates should not be broken off while casting is still hot. GN (12c)

Developments Abroad in Cooling Beds for Rod Mills. H. Illies. *Iron & Steel Industry & British Foundryman*, Vol. 6, Nov. 1932, pages 35-37, 42. Describes Demag Eccentric, Schloemann and Krupp high output cooling beds and accessories. CHL (12c)

New Type of Roll for Cold-rolling of Metals. (Ein neuer Walzentyp für das Kaltwalzen von Metallen.) F. Krau. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 226-229. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. Hardness of ordinary chilled Fe rolls is not sufficient to prevent slight surface penetration during rolling by metal splinters, etc. Such rolls will have a Brinell hardness of 530 maximum, whereas a hardness of 630-680 is necessary. Pearlite matrix of ordinary roll limits the hardness, but this limit may be raised by alloying with Ni and Mn, or Cr, W, and Mo. Alloyed chilled rolls are martensitic and have a Brinell hardness of 650. Alloyed Fe is made in an electric furnace. Roll produces high-finish sheets, and costs of maintenance are not increased. RFM (12c)

The Mechanical Auxiliaries and Automatic Working of 3-High Roughing Mills. (L'Appareillage Mecanique et L'Automatization des Trains Degrossisseurs Trios.) E. Kaestel. *Genie Civil*, Vol. 99, Dec. 26, 1931, pages 641-644. Illustrated particulars are given of several 3-high roughing mills of Krupp-Grusonwerk. Auxiliary machinery by which blooms are turned and entered into various passes is automatic in action. Ha (12c)

The Dimensions of Bearing Brasses and the Question of Material and Lubrication in the Rolling Mills. (Les dimensions des coussinets et la question de la matière employée à leur fabrication et de leur graissage dans les laminoirs). A. Kretzler. *Revue de Métallurgie*, Vol. 29, Dec. 1932, pages 613-618. For proper service the brasses used in rolling mill bearings must be properly designed and lubricated. The author gives the dimensions found by him as the required minimum for good performance. Bearings with brasses provided with slots filled with graphite are recommended. JDG (12c)

Die Casting Equipment. (Spritzguss-Anlage.) Carl Krömer. *Zeitschrift für wirtschaftliche Fertigung*, Nov. 1932, section Met., 1 page. Author describes die casting equipment of Braunschweig Hüttenwerk Co. Equipment described is suitable only for die casting of Pb-Sn-Sb-Cu alloys, and not for Zn and red brass. Advantages of die casting machines are enumerated. GN (12c)

Cast Iron Rolls. (Les cylindres de Laminoirs en Fonte.) Ernst Peipers. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, June 1932, pages 213-217. Translation of an article from *Stahl und Eisen*. See "Manufacture of Cast Iron Rolls," *Metals & Alloys*, Vol. 2, Nov. 1931, page 270. FR (12c)

Recent Developments in Rod and Wire Mills. Albert Nöll. *Metallurgia*, Vol. 6, Aug. 1932, pages 123-124, 127. **New Continuous Wire Rod Mill at the Works of Niederrheinische Huette in Duisburg.** *Iron & Coal Trades Review*, Vol. 124, May 27, 1932, pages 867-871. Extended abstract of article in *Stahl und Eisen*. See "Modern Improvements in Refined Iron and Rod Mills," *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 76. JLG + Ha (12c)

Automatic Screwdown Control Saves Time on Roll Settings. T. R. Rhea. *Steel*, Vol. 90, May 2, 1932, pages 31-34. Description of an automatic preset screwdown control system for rolling mills. This system makes use of "selsyn units" in pairs for controlling position of screwdown mechanism and of thyratron tubes for making electrical contact. JN (12c)

Manufacture of Rolls. (Om tillverkning av valsar.) I. Sahlin. *Jernkontorets Annaler*, Vol. 114, Oct. 1932, pages 469-502. Summary of prevailing practices and influence on quality of various factors, such as added constituents, manner of melting and casting. 39 references. HCD (12c)

Silent Chain Drive Applied to Three-Stand Mill. P. V. Stevenson. *Steel*, Vol. 90, Apr. 18, 1932, pages 33-34. Describes installation of a set of silent chain drives in a 3-stand continuous mill in Pittsburgh district. Use of standard equipment and avoidance of elaborate shaft mountings, thrust bearings and bevelled gears permit repairs, renewals and changes to be made readily. These drives are claimed to be quiet, efficient and fairly free of vibration. JN (12c)

Advance in Steel Mill Practice in Europe. W. Trinks. *Iron Age*, Vol. 128, Dec. 31, 1931, pages 1497-1498. Abstract of report to American Society of Mechanical Engineers. Review of outstanding developments in Germany. Seamless pipes are rust proofed by a form of chlorinated rubber in solution instead of with bakelite. Extrusion has been perfected and process is in commercial operation. Seamless drums 22 ft. long and 44" in diameter and walls running to 3" thickness or more. Wide-flange beams are not much used. Ingots are rolled butt end first. VSP (12c)

Determination of the Capacity of a Blooming Mill. A. P. Vinogradov. *Domez*, No. 9, 1932, pages 18-23. (In Russian.) A formula is developed for the capacity of blooming mills of American type based on the angular velocity of the rolls. When applied to the practice it gave satisfactory results for given ingot weights and cross sections of the blooms. (12c)

18,000 HP Reversing Mill Motor and other Material for the New Steel Works of the South African Iron and Steel Industrial Corporation. *English Electrical Journal*, Vol. 6, Oct. 1932, pages 76-78. The blooming mill installation consists of a reversing mill equipment to give a peak power of 18,000 h.p. at 80 r.p.m. and a speed variation from 0 to + and — 180 r.p.m. operated by a variable-voltage motor-generator Ilgner set and exciter set. The bar mill equipment mainly comprises 5 d.c. motors, 2 of 2200 h.p., 2 of 450 h.p. and 1 of 250 h.p. with Ward Leonard starting and speed variation by shunt regulation. The blooming mill motor is intended to drive a 3-stand reversing mill with cogging, roughing and finishing housings for dealing with 2-ton ingots and turning out billets, various merchant bars, rails, etc. The somewhat high speed is due to the desire to finish off the long passes rapidly. The auxiliary equipment is also fully dealt with with emphasis on the electrical features. WH (12c)

New Reversible Bloom and Slab Mills. (Neue Umkehr-Block- und Brammenstrassen.) *Demag Nachrichten*, Vol. 6C, Nov. 1932, pages 33C-38C; *Demag News*, Vol. 6C, Nov. 1932, pages 33C-38C. Description of new blooming and slab mills recently built by Demag Co. at plants of Les Petits Fils des Fois de Wendel at Fenderie and Moyeuvre, Lorraine. Mill is completely electrified. GN (12c)

Demag Electro Roller in the Tube Mill. (Die Demag-Elektrorolle im Rohrwalzwerk.) *Demag Nachrichten*, Vol. 6C, Nov. 1932, page 41C; *Demag News*, Vol. 6C, Nov. 1932, page 41C. Brief description of special types of electrically driven rollers for transportation roller beds in tube mills. GN (12c)

Special Bronze for Telephone and Telegraph Conductors. Sam. J. Rosch. *Wire & Wire Products*, Vol. 7, Sept. 1932, pages 284-285, 303; Nov. 1932, pages 387, 390-391, 396. Equipment for molding and rolling, and methods of adjusting passes in rolling ingots are described. It is recommended that when rolling bronze in intermediate rolls entire rod pass through one groove before it passes to next one so that rod does not run through 2 or 3 passes simultaneously. This should be done in order to avoid cumulative heating of the rod with mechanical working. In order to obtain desired tensile strength on finished product it is important that during each pass rod should be at a colder temperature than in preceding pass. Ha (12c)

Keep Up With Modern Rolling Mill Practice

For cold rolling watch also Section 12j "Cold Working."

The Abstracts will help you

Forging (12d)

Forged Pressure-Drums for Boilers. *Metallurgia*, Vol. 7, Dec. 1932, pages 35-36. Brief discussion of some very large hollow forgings produced by the English Steel Corp. JLG (12d)

Large Forgings. (Grosse Schmiedestücke.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Dec. 18, 1932, pages 674-675; *Schweizerische Technische Zeitschrift*, Vol. 29, Dec. 22, 1932, page 783. Illustrated description of largest forging press of the world installed at Krupp Works, Essen. Maximum forging pressure: 15000 tons, maximum weight of raw ingot that can be forged on press: 250 tons. All dimensions of press are given. Hollow bodies weighing 113 tons, 21 m. long, with an outer diameter of 1.4 m. and an inner diameter of .71 m. have been forged on this press. GN (12d)

Template Making in Fabrication of Dies. (Der Schablonenbau in der Gesenkfabrikation.) *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Nov. 10, 1932, pages 129-131. Discusses difficulties encountered in making template for hot forming dies. GN (12d)

Fine Forgings Require Correct Heating and Grain Flow. Adam M. Steever. *Metal Progress*, Vol. 21, June 1932, pages 50-54. Summary of effects of heating rate, time at heat, maximum forging temperature on quality of forgings. Influence of grain flow in forgings where high resistance to stresses and impact is essential is briefly treated. WLC (12d)

Hand Forging. (Das Freiformschmieden.) Chr. Schlingmann. *Werkstattstechnik*, Vol. 26, Sept. 15, 1932, pages 360-361. Describes various stages of process with special regard to time study, temperature, etc. RFV (12d)

Effect of Final Forging Temperature on Strength and Structure of Cr-Ni Steels. (Slutsmidningstemperaturens och nedsmidningens inverkan pa hallfasthetsegenskaper och struktur hos ett kromnickelstal.) Nils Elfström & Pehr E. Lagerhjelm. *Jernkontorets Annaler*, Vol. 116, Sept. 1932, pages 413-438. Lowering of final working temperature appears to increase tensile strength while breaking strength is not affected. Toughness to hammering is markedly improved. Continued working generally improves strength, but cross sectional samples will often show some deterioration. A final normalizing heat will largely even out all differences due to temperature or degree of working, except with regard to hammering toughness. 19 references. HCD (12d)

Shearing & Punching (12e)

Cold Cutting and Working of Iron and Steel Plates. (Schneiden und Bearbeiten von Eisen- und Stahlblechen in kaltem Zustand.) H. Wilhelm. *Maschinenbau*, Vol. 11, May 19, 1932, pages 210-213. Brinell and metallographical tests show how cold sheared edges impair quality of material. The thicker the plate, the duller the shears and the more apart the shear blades are, the farther the increase in hardness extends into the plate. Average increase in hardness is 58%. Influence on the impact test is even greater especially after an artificial aging. Extent of influence into plate is generally underestimated and is made clear in some photomicrographs by Fry's etching solution. These facts are most important for any subsequent cold work applied to the plate (cracks in bending or in straightening or flanging, etc.). This does not refer to plates of less than ½" and of less than 50 kg./mm.^{2} tensile strength. Elimination of the defects is only possible by normalizing or planing or at least by filing or grinding off the edges. Torch cutting averages an increase in hardness of about 43% in first part of cut but does not reach nearly as far into plate and does not leave any sharp edges. RFV (12e)

Investigations on Punching Tools. (Untersuchungen an Stanzwerkzeugen.) Bruno Deja. *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 9, Jan. 10, 1933, page 7. Former types of punching dies are critically discussed and a new one is described which is to guarantee better working and higher durability. GN (12e)

Extruding (12f)

Work Factors in a Directly Driven 1500 ton Press with 300 Atmospheric Press Pressure. (Arbeitsverhältnisse an einer direkt angetriebenen 1500 t-Strangpresse mit 300 at Pressdruck.) Chr. Bernhoeft. *Zeitschrift für Metallkunde*, Vol. 24, Sept. 1932, pages 210-213, 261-263. A very lengthy account of plant data on behavior of different types of presses for extrusion of bars, and of different types of materials extended. Flow diagrams are given. RFM (12f)

Sheathing Cables with Lead. J. R. Shea. *Dutch Boy Quarterly*, Vol. 10, 1932, pages 4-5. Improved type of sheathing press of Western Electric Co. as well as a new system whereby Pb-Sn alloy used for sheet is melted centrally and distributed to various presses are described in full detail. EF (12f)

Machining (12g)

Widia X, a New High Speed Cutting Metal for Working Steel. (Widia X, ein neues Schneidmetall für Stahlbearbeitung.) A. Fehse. *Maschinenbau*, Vol. 11, Apr. 7, 1932, page 144. Works more economically than common Widia for all kinds of steel (C and alloy steel, stainless steel, steel castings, even austenitic Mn-steel). Difference in chemical composition causes change of some physical properties: hardness and heat expansion are unchanged. Lower heat conductivity requires more care against sudden changes of temperature and unequal heating or cooling. Widia X is not very sensitive to shocks and allows heavy cuts and high cutting speed giving better surface thereby. Table gives cutting angles, etc. RFV (12g)

FOUNDRY PRACTICE & APPLIANCES (22)

Technical Instability Factors Peculiar to Specialized Foundries. (Sur les Facteurs Techniques d'Instabilité Particuliers aux Fonderies trop Spécialisées). R. De Fleury. *Bulletin de l'Association Technique de Fonderie,* Vol. 6, July 1932, pages 235-247. Paper read before World Foundry Convention, Paris, 1932. Theoretical paper dealing with unknown factors, acting as poison, which periodically cause troubles which, in turn, vanish under the effect of other likewise unknown factors, acting as antidote. Although those factors are not yet known, they can be thoroughly measured through the progressive depreciation (for instance depreciation of metal or alloy by slow increasing of impurities due to successive remelting). The author gives numerous formulas and charts which permit studying the effect of such factors previously mentioned. He explains that troubles are more acute in specialized foundries and particularly in foundries manufacturing only one type of castings and that it is possible to greatly reduce the probability of trouble by joining to the "first zone" fabrication, a "second zone" production, preferably in a different shop, dealing with products made in not so great quantities as in the first shop and affording, owing to less severe specifications, the use of low quality scrap or returns. FR (22)

Rapid progress in casting metals calls for superior foundry control

Is your department keeping pace with 1933 operating methods?

Read these abstracts and be well informed. Sections 12a on "Melting and Refining," 12b on "Casting and Solidification" and 23 on "Furnaces and Fuels" also contain information of value to you.

The Use of Dolomite as Flux in Cupolas. A. H. Dierker. *Ohio State University Engineering Experiment Station News,* Vol. 4, Oct. 1932, pages 1-2. Injurious part of slag consisting of refuse material of ash of coke, cupola lining, and sand and rust adhering to scrap and pig Fe is explained. Slag should have sufficient fluidity to be easily removed. This purpose was readily attained by using dolomite (Ca-Mg carbonate) as flux. It contains CaO 30.2%, MgO 21.6%, CO_2 47.7%, SiO_2 and Al_2O_3 combined less than 0.5%. A special advantage is that pick-up of S from the fuel was just ½ amount absorbed when straight limestone was used and about 8/10 of that with limestone and fluorspar as flux. Ha (22)

Builds Patterns For Worm and Gear Wheel. J. G. Fitzpatrick. *Foundry,* Vol. 60, Jan. 15, 1932, pages 19-21. Gives detailed description of making full-sized layout in the manufacture of patterns for worm and gear wheel. VSP (22)

Cupolas and Blowers. J. E. Fletcher. *Iron & Steel Industry & British Foundryman,* Vol. 6, Dec. 1932, pages 69-72. Discusses thermal efficiency and gas distribution in the hearth of the cupola furnace. Recently developed balanced blast cupola is described. CHL (22)

Origin of White Iron Castings with a Gray Skin and of Mottled Iron. K. A. Eremin. *Domez,* No. 1-2, 1932, pages 29-31. (In Russian.) After critically examining literary data (23 references) Eremin concludes that in process of solidification outer skin originally formed by action of mold is heated by heat contained in inside layers until it graphitizes, while for core it acts as a chill speeding its cooling to extent that no graphite precipitates. Speed of cooling supplied by mold has a direct influence on these phenomena. (22)

Some Special Cores. (Quelques Noyautages Spéciaux.) H. Fabre. *Bulletin de l'Association Technique de Fonderie,* Vol. 6, July 1932, pages 226-235. Paper read before World Foundry Convention, Paris, 1932. Author reviews fabrication of cores which are not obtained with help of ordinary core boxes. The kinds of cores studied are: (a) cores rammed in sand core boxes, (b) loam cores made of 2 halves subsequently assembled, (c) loam cores swept on a perforated tube, (d) cores swept with jigs and templates, (e) big loam cores with brick structure, (f) cores made with skeleton patterns, (g) cores rammed in the molds themselves, (h) very special cores such as those for jacketing large cylinders. FR (22)

Foundry Blacking. E. Feil. *Foundry Trade Journal,* Vol. 47, Aug. 18, 1932, page 100. An extended abstract of an article which appeared in Die Giesserei. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 356. OWE (22)

Efficient Casting Design. F. C. Edwards. *Foundry Trade Journal,* Vol. 47, Sept. 15, 1932, page 161-162. Improvements that can result from alterations in the design of castings having a flat top are discussed. OWE (22)

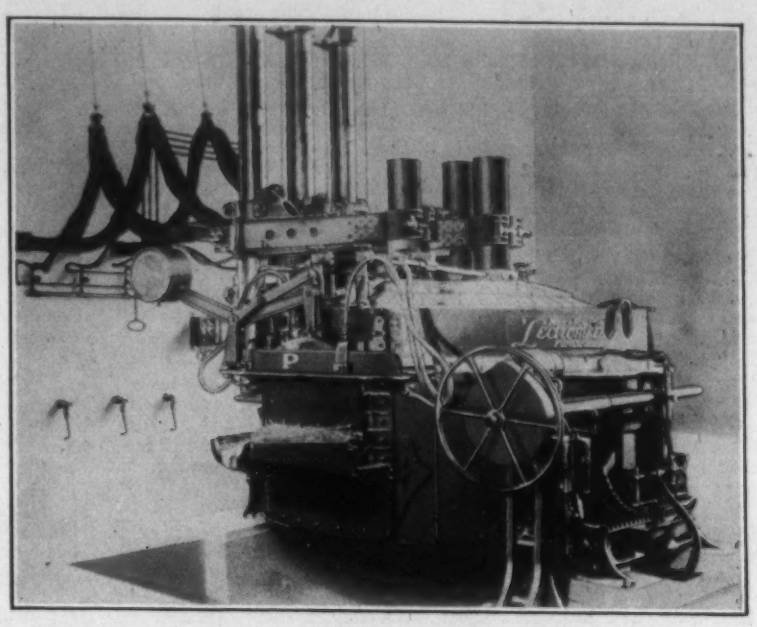
Monorail Materials Handling and the Foundry. J. B. Forker. *Transactions American Foundrymen's Association,* Vol. 3, Nov.-Dec. 1932, pages 375-386. Uses for monorail in foundry are described. CHL (22)

Contribution to Pattern Making. (Ein Beitrag zum Modellbau.) Hans Eckart. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Nov. 13, 1932, pages 461-462. Author shows improper pattern may make molding very difficult. GN (22)

New Molding Method and Its Effect on Capacity, Wages and Costs in Foundry. (Ein neues Formverfahren und seine Auswirkung auf Leistung, Löhne und Unkosten in der Giesserei.) Geissel. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Nov. 13, 1932, pages 450-452. Method, which may be used in combination with described Eckstein patented double side-press molding machine, is described. This machine is built for manual drive, as well as hydraulic and compressed air drive. Capacities of latter 2 types are about 25% higher than for manual drive. Applicability of new machines is practically unlimited. Economic considerations show new method and machines to be highly efficient. Production per shift and man as compared with former methods could be increased from 468 to 1266 kg. of a certain casting. GN (22)

The Iron Foundry of the Future. W. H. Chaffe. *Foundry,* Vol. 60, Jan. 1, 1932, pages 39-40. Foundry management has not kept abreast of the times and has not been prepared to meet modern conditions. Production of gray Fe is affected by tendency toward more definite specifications and substitution of sheet metal, steel or alloy steel castings. Increased demand for castings of definite specifications requires more accurate control of melt and cupola temperatures, also better control specification of raw materials. Solution of problems confronting average foundry require study and investigation. VSP (22)

Control of Molding Sands. (Controle des Sables de Moulage.) G. Henon. *La Fonte,* Apr. 1932, pages 120-135. Possibilities of application of sand testing in jobbing foundries. Constituents of molding sand: clay and quartz. Preparation of sand: facing and backing sand. Properties of sand: strength permeability, humidity, refractoriness, durability. Testing apparatus. Ramming of samples. 22 references. FR (22)



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Some Lifting Considerations in a Jobbing Steel Foundry. F. J. HEMMING. *Foundry Trade Journal*, Vol. 47, Aug. 4, 1932, pages 61-62, 70. An article (accompanied by 5 diagrams) illustrating 2 simple improvements in foundry design which have been the outcome of experience—(1) the introduction of greater flexibility of lifting power in a heavy foundry and 2 a simple expedient to meet the most pressing requirements in a light foundry. OWE (22)

On a Hitherto Generally Unknown French Flaskless Molding Method. (Über ein in Deutschland bisher noch nicht allgemein bekanntes französisches kastenloses Formverfahren.) H. BUSCHMANN. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 11, 1932, page 496. Abstract of paper before annual meeting of Verein deutscher Giessereifachleute, Nov. 12, 13, 1932, Berlin. Author described molding method as discussed by Maillard at the International Foundry Congress, Sept. 1932, Paris. GN (22)

Casting of Water Meters in Green Sand. (Das Giessen von Wassermessern im Nassguss.) A. HEINZ. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 2, 1932, pages 395-398. Discusses various failures that may occur in green sand casting water meters with special reference to molding practice. Sand is frequently rammed too loose. Points for obtaining a smooth casting and composition of proper molding sands are discussed. Proper selection of suitable binders is considered at length. GN (22)

Gating of Red Brass Rolls. (Ueber den Anschnitt bei Rotgussrollen.) A. HEINZ. *Zeitschrift für die gesamte Gissereipraxis*, Vol. 54, Jan. 22, 1933, pages 33-35. Discussion of proper gating on red brass rolls and valve seats. Author shows for these 2 cases that best results are obtained when the liquid metal flows only a short way in the gates. GN (22)

Cheap Method for Making Pattern-Plates. F. BROBECK. *Foundry Trade Journal*, Vol. 47, July 21, 1932, page 36. Extended abstract of an article which appeared in *Die Giesserei*. See "A New Method for the Inexpensive Manufacture of Reversible Pattern Plates," *Metals & Alloys*, Vol. 3, May 1932, page MA 144. OWE (22)

Cast-Iron Scrap in Cupola Metal Mixtures. W. H. BLEEKE. *Foundry Trade Journal*, Vol. 47, Sept. 8, 1932, page 142. Discusses advantage of using scrap, referring to these under headings (a) economical and (b) metallurgical. Scrap metal being cheaper than pig Fe it reduces original cost of casting metal. 2 types of material are available—foundry scrap and foreign scrap. Suitability of latter is determined by class of castings being produced, degree of uniformity in its composition, and, finally, size and thickness of material. Attention is directed to melting of scrap, and such characteristics as rustiness and oxidation are dealt with in some detail. OWE (22)

Molding Plumbing Goods. EDWIN BREMER. *Foundry*, Vol. 60, Feb. 15, 1932, pages 10-13. Describes Royal Brass Mfg. Co., Cleveland, makers of brass castings for modern bath rooms. Foundry melts approximately 2½ tons of metal/day. Metal is melted in 8 pit-type, coke-fired furnaces. Alloy usually employed contains 85% Cu, 5% Sn, 5% Zn and 5% Pb. Other alloys used include Ni-Ag. VSP (22)

Pulverized Coal in Molding Sand. (Steinkohlenstaub im Formsand.) P. AULICH. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 11, 1932, page 496. Abstract of paper before annual meeting of the Verein deutscher Giessereifachleute, Nov. 12-13, 1932, Berlin. Requirements which such pulverized coal has to meet are discussed. GN (22)

Low Carbon Cast Iron from Cupola. (Sehr niedriggekohltes Gusseisen aus dem Kupolofen.) G. DELBART & E. LECOEUVRE. *Maschinenbau*, Vol. 11, Oct. 6, 1932, page 403. (Abstract.) Paper read before International Foundry Congress, Paris, Sept. 1932. In a common cupola with forehearth they melted gray iron within following limits: 1.7-2.5% C, 1.6-4.5% Si, 0.36-3.75% Mn, up to .77% Cr, .07-.37% P and .026-.097% S. Dipping coke in lime was of no advantage. No difficulties were met in casting as low a wall thickness as 10 mm. This is made easier by raising Si, Mn and P content slightly. Low C cast Fe inclines strongly to piping, especially if cast at low temperature. Tensile strength does not decrease with C content. Highest hardness was found at low Si (1.6-1.8%). Lowest bending strength coincides with higher Mn content. Effect on hardening caused by higher Mn can be compensated by increasing Si. High Mn-low C cast Fe is suitable for a subsequent heat treatment (hardening in air blast), especially since no graphite formation has to be feared at certain temperatures. In drawing, hardness does not decrease much up to 300° C. Bending resistance shows a maximum at 300° and at 750°-800° C. Low C pearlitic cast Fe with high Mn shows fair fluidity especially with a C content above 2.3% is very stable and suitable for martensitic hardening and has high physical properties and sufficient workability. RFV (22)

Making of a Housing for Turbo-Blowers with Templates. (Die Herstellung eines Gehäuses für Turbogebläse mit Schablonen.) GUSTAV SCHUELE. *Die Giesserei*, Vol. 19, Dec. 23, 1932, pages 519-521. Making of mold and cores for a housing of 1350 mm. width, 2300 mm. height, 18 mm. wall thickness, 2700 kg. weight is described in detail. It required 192 hrs. Ha (22)

Preparation and Casting of Nickel Manganese Brasses. (La fabrication des laitons au nickel manganese.) A. LE THOMAS. *Revue du Nickel*, Vol. 3, Apr. 1932, pages 65-70. Principles for preparation and casting of 5% Ni, 3% Mn brasses. AH (22)

Manufacture of a 7 Ton Rectangular Cast Iron Trough Resistant to Acids, with Special Reference to Application of Simplified Methods Intended for Repetition work. (Mémoire sur la Fabrication d'une Cuve Rectangulaire de 7 Tonnes en Fonte Résistant aux Acides, avec Application de Méthodes Simplifiées Afférentes à une Fabrication en Série). F. SIMORRE. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, July 1932, pages 249-274. Paper read before World foundry Convention, Paris, 1932. Description of casting to be made, mold, flasks and appliances is given. Very detailed study of time and cost of fabrication is made. Cast Fe to be used must answer the following requirement: Weight lost must be less than 3-8% when immersed 24 hours in a mixture of 3 parts H_2SO_4 66° Bé and 1 part HNO_3 48° Bé with twice as much water. Taking as basis the numerous data published on the matter of corrosion resistance of cast Fe and after preliminary tests, the author has adopted the following composition: total C 2.7, Si 1.5, Mn 0.55, P 0.35, S 0.04, which proves suitable as to the chemical specifications, has good machinability together with good mechanical properties: tensile strength 27 kg./mm^2, Brinell hardness 180. FR (22)

Sensibility of Cast Iron to Variable Wall Thicknesses. (Die Wandstärkenempfindlichkeit von Gusseisen.) E. SÖHNCHEN. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Jan. 22, 1933, pages 25-28. Author discusses detrimental effects of variable wall thicknesses on mechanical properties and shrinkage of castings as caused by varying graphite content. Present knowledge is reviewed. It is shown that Si and P are most unfavorable, Al and Cr rather neutral and Ni most favorable to lessening sensibility of the properties to varying wall thicknesses. To obtain uniform structure and strength Si and P should be low. Various methods to attain this end are discussed, as Lanz method, Emmel method and Krupp method, latter 2 particularly aiming at a low C content. Of similar importance are methods to produce cast Fe with a favorable distribution of graphite. Discussion shows that foundryman is in a position to process cast Fe of high insensibility to variable wall thickness, either by alloying or methods above mentioned. Methods are finally considered for testing sensibility to varying wall thicknesses. GN (22)

Contribution to the Study of Foundry Sand Permeability. (Contribution à l'Etude de la Perméabilité des Sables de Fonderie.) H. VIEZ. *Bulletin de l'Association Technique de Fonderie*, Vol. 5, Apr. 1932, pages 122-125. Abstract of a paper presented at the International Foundry Convention of Milan, 1931. See *Metals & Alloys*, Vol. 3, May 1932, page MA 145. FR (22)

Thermal Cracks and Casting Stresses as Causes of Failure. (Warmrisse und Gussspannungen als Ausschussursache.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Sept. 4, 1932, pages 351-352. The various causes of thermal cracks are dealt with: (1) sharp transitions from thin to thick cross-sections, (2) physical properties of mold material, (3) wrong gating. Using as an example a valve stopcock with exceptionally long outlet, proper and wrong gating shown. GN (22)

Die Casting. (La technique de la coulée sous pression.) G. IVANOW. *Revue Industrielle*, Vol. 62, Jan. 1932, pages 48-52. Discusses Zn-Pb base alloys, Zn base alloys, Al base alloys, Mg base alloys and Cu base alloys. Numerous compositions of alloys are given in 5 tables. Pressure casting practice. Influence of pressure and casting temperature. FR (22)

Mixing in Old and New Times. (Das Gattieren in Alter und Neuer Zeit.) R. B. OSANN. *Giesserei*, Vol. 19, Mar. 19, 1932, pages 101-106. The paper gives an historical review of the art of mixing, that is, the selection and mixing of different sorts of raw Fe and scrap so that good castings can be made of the molten mass. A few recipes are given for cast irons for melting in the cupola furnace and for special purposes such as cylinders for gas engines, steam engines. The calculation of the eutectic Si content is explained and how it must be modified with varying wall thickness. The importance of the eutectic structure for castings and their applications is pointed out, especially as it offers a method for calculating with a simple formula, on the basis of the composition, tensile and bending strength of the material. The advantages of the recently developed types of cast irons, Migra iron, HK iron, etc. are briefly discussed. They are due to a treatment for freeing them of the scum before freezing. Ha (22)

Melting Gray Iron in The Electric Furnace. ALBERT E. RHOADS. *Iron Age*, Vol. 129, Apr. 28, 1932, pages 968-970. Development of far reaching possibilities of cast Fe has been accomplished recently through the perfection of an electric furnace in which high test Fe is made. Resulting materials are: high-Si, high-C, low-C and medium Si Fe. Choice of 3 methods are available: (1) Melting entirely from cold; (2) Duplexing; and (3) Combination of cold and duplexing. Manufacture of short anneal malleable and heat treated casting products are frequently made in rocking indirect arc furnace. The indirect rocking electric furnace operating on cast Fe produced a high degree of superheat easily, quickly and under accurate control; produces any predetermined analysis; maintains reducing conditions within furnace from heat to heat; and mixes the metal to produce a uniform product. A number of automobile plants are using rocking type furnaces to produce a variety of castings by cold melting, duplexing and triplexing. Many of the products are given a quick anneal for malleableizing while others are alloy Fe which are nitrided. Gives tabulated data on cost of electric furnace Fe. VSP (22)

The Plastic Deformations of Jolted Molds Under the Influence of Liquid Iron. (Die plastischen Deformationen von gerüttelten Gussformen unter dem Einfluss des flüssigen Eisens.) H. UNUCKA. Doctor's thesis, Technische Hochschule Karlsruhe, 1932, 67 pages. The investigation proves that the pressure in molds chiefly depends on the ferrostatic pressure present at a spot of the mold and the local density of the mold. Next in importance are the physical properties of the molding sand, including its humidity, the shape of the piece, the volume of the cavities, the weight of the casting and the temperature of the melt. 14 references. GN (22)

Cupola Operation with Special Reference to Blast, Gas and Power Consumption. (Der praktische Kupolofenbetrieb unter Berücksichtigung des Wind-, Gas- und Kraftverbrauchs.) *Zeitschrift für die gesamte Giessereipraxis*, Vol, 53, Oct. 16, 1932, pages 414-416; Oct. 30, 1932, pages 433-434. The importance of accurate calculation and proper distribution of the blast for good cupola operation is emphasized. Advantages derived from cupolas with forehearth are considered. A rapidly melting cupola producing hot Fe is indispensable for processing high quality cast Fe. Proper composition of the slag is stressed. The requirements for foundry coke are dealt with. It is a great mistake to have too small a share of Fe in the burden, the Fe charge depends on the cupola cross-section in front of the tuyeres. Proper relations between height of the cupola and area of the melting zone as well as those between tuyeres and melting zone are considered in examples. An indication of proper blast is the flame on the throat of the cupola. GN (22)

Modern Core Making. JOHN A. SMEETON. *Iron & Steel Industry & British Foundryman*, Vol. 5, Apr. 1932, pages 261-263. A description of several modern core making machines for all types of foundry cores. CHL (22)

Machinery Export to Russia, Especially Machine Tool Castings considered from the Foundry Point of View. (Die Russenlieferungen, insbesondere Werkzeugmaschinenguss vom Giessereistandpunkt betrachtet.) ALFRED XANTEN. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Sept. 4, 1932, pages 343-345; Oct. 16, 1932, pages 411-412. The paper deals with difficulties arising in casting machine tool parts for Russia due to the requirement of a certain hardness which is contrary to common specifications. Practical experiences in processing such castings of various wall thicknesses and other structural peculiarities tending to failure are described. The problem is considered from the viewpoint of the burden. A charge with 2.8-3.0% total C, 1.30-1.40% Si, 1.50% Mn and lowest possible P and S content proved best. The relatively high Si content was chosen to avoid pipes. The difficulties are discussed arising in making cast Fe with the low C content. The author found the following composition best: C: 3.3-3.4%, Si: .85%, Mn: .8%. With the lowest Si content pieces having transverse ribs of only 6 mm. wall thickness could also be cast without tending to white fracture and cracks. GN (22)

Carbonization Reaction in the Cupola. (Zur Frage der Kohlungsvörgange im Kupolofen.) KARL SIPP & PAUL TOBIAS. *Stahl und Eisen*, Vol. 52, July 7, 1932, pages 662-664. By means of a series of operating tests it was established that the carbonization of cast Fe in the cupola furnace is mainly dependent on the C-content of the mixture. The less the C-content of the mixture, the higher the absorption of C. Furthermore, the enrichment of the melt in C is greater, the less the Si-content of the charge, the greater the reactivity of the coke, the wider the tuyere zone, and the longer the Fe remains in the furnace pit. The influence of the size of steel pieces was not observed for carbonization. DTR (22)

Correlation of Casting Design and Foundry Practice. ALEX TAUB. *Transactions American Society of Mechanical Engineers*, Vol. 54, June 30, 1932, Machine Shop Practice, pages 97-104. Examples are discussed to emphasize coöperation of engineering department and foundry for correlation of design to foundry practice and the great economical advantages accruing. Ha (22)

Effect of Gating and Charge on the Soundness of Large Castings. (Welchen Einfluss haben Anschnitt und Gattierung auf grosse Gusstücke.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 30, 1932, pages 431-433. The paper discusses the effect of the arrangement and number of gates on the soundness of large castings with special reference to defects occurring in flanges of armatures and beds of tool lathes. Effect of the unfavorable composition of the charge, and the disadvantages of improper casting temperatures are pointed out. GN (22)

The Use of Silicon and Manganese Briquets in the Cupola. LYNN H. RANSOM. *Transactions American Foundrymen's Association*, Vol. 3, May-June 1932, pages 16-28. A comparison of cast irons made by the addition of Si and Mn briquets to the cupola and heats of similar analysis produced with larger percentages of pig Fe in charge indicated that high grade castings are produced economically with briquetted alloys. CHL (22)

Investigations of a Vibrating-Molding Machine of 1000 kg. Lifting Capacity Operated by Compressed Air. (Untersuchungen an einer mit Pressluft betriebenen Rüttelformmaschine von 1000 kg. Hubvermögen.) R. WALLE. *Giesserei*, Vol. 19, Mar. 4, 1932, pages 81-88; Apr. 1, 1932, pages 122-127. Vibrating molding machines have the advantage that they eliminate the tamping of large molds and obtain a better and more uniform compression of the sand than is possible by pressing or tamping. A new construction of such electrically driven machines is described in detail and a number of tests to prove its efficiency under different operating conditions are reproduced in diagrams. Ha (22)

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FURNACES & FUELS (23)

A New Melting Furnace. (Ein neuer Schmelzofen.) G. Zotos. *Feuerungstechnik*, Vol. 20, Sept. 15, 1932, pages 135-136. Importance of heat concentration and pre-heating are stressed. The theoretical maximum temperature due to preheating the combustion air is given as follows:

Air preheated to:	800° C.	1000° C.	1200° C.
Pulverized Coal	2205° C.	2310° C.	2400° C.
Fuel Oil	2260	2410	2485
Water Gas	2420	2530	2590

With working temperatures between 1200° and 1600° C. an efficiency of 50-80% should be possible. The standard metallurgical tank furnaces have a thermal efficiency of only 10-18%. The principal mistake in designing is the unfortunate distribution of the areas enclosing the combustion space. The large area of the ceiling and side walls uselessly dissipates heat to the outside, while the surface area of the bath is relatively small. The writer's principle in furnace design involves a rotating drum in which the melt entirely covers the furnace lining due to the centrifugal force while the combustion takes place in the hollow inside. EF (23)

A Common Error in Flue Gas Analysis and Heat Balances. W. Trinks. *Fuels & Furnaces*, Vol. 10, June 1932, pages 411-412. Usual assumption that no H is present in combustion gases is erroneous. Table is given showing error made in figuring heat loss in % of higher heat value of a fuel with and without H being considered. For ordinary purposes it is sufficient to assume CO and H to be present in equal percentages. Ha (23)

Butane as a Fuel for the Mining and Metallurgical Industry. Rudolph Gahl. *Engineering & Mining Journal*, Vol. 133, Dec. 1932, pages 638-639. Butane can be used to advantage in carburizing, annealing, and forging furnaces. So-called surface combustion systems are effective with butane. It also might be used as a flotation reagent and as a refrigerant. WHB (23)

Fuel Oil in Metallurgical Melting and Heating Practice. T. F. Unwin. *Metallurgia*, Vol. 7, Dec. 1932, pages 49-51. General discussion of suitability of fuel oil for metallurgical heating. JLG (23)

A New Oil-Fired Furnace for High-Test Cast Iron. F. Brocke. *Foundry Trade Journal*, Vol. 47, Sept. 8, 1932, page 144. Describes method of producing high-test cast Fe, which involves superheating molten Fe in cupola, and refining by a duplexing process in what is known as Schury oil-fired open-hearth furnace. As many as 20 installations of this furnace are in operation in Germany's foundry industry. Normally, liquid gray Fe is refined in 1 hour, the oil consumption being 4% of the charge. OWE (23)

New Oil Firing Method for Cupolas. (Neue ölfeurung für Kupolöfen.) E. Becker. *Feuerungstechnik*, Vol. 20, May 1932, pages 71-72. Previous attempts mainly failed since the starting and gradual progression of the melting process could not be combined. The essential feature of the new furnace, "S Type Marx," is a refractory cylinder on top of which the furnace charge rests. Several oil burners are arranged tangentially around this refractory cylinder. Drops of molten Fe run into the inclined annular hearth. Center block, which can be raised and lowered during idle periods, consists of an Fe tube provided with a refractory shell. The stack is hollow and is used for preheating the combustion air, employed at 600 mm. H_2O pressure. Lime additions are reduced greatly and output per shift is increased by 10-25%. Starting time is 20 min. Following metallurgical advantages are claimed: production of an Fe low in S, destruction of graphite nuclei due to intense rotation and high temperatures, small losses and melting of an Fe low in C. Using 20-25% hematite and 80-75% cast Fe scrap, an Fe with following physical properties was obtained: tensile strength = 25-26.7 kg./mm.^{2}, bending strength = 45.3-46 kg./mm.^{2}, deflection = 12.2-13 mm. at 600 mm. suspension, Brinell hardness = 188-179. Oil consumption = 6.5% of the charge at an output of 1500 kg./hr. (instead of 15% coke). The thermal efficiency is 42.7% as compared with 23.8% with reference to coke. EF (23)

Fuel Consumption and Thermal Efficiencies in Core and Mold Oven Practice. C. F. Mayer. *Fuels & Furnaces*, Vol. 10, Nov.-Dec. 1932, pages 599-601. Procedure in design of an oven for drying of covers and molds is explained; no rule of thumb need be applied; data for several sand mixtures are given and important factors in arriving at fuel consumption are discussed. Ha (23)

Electric Core-Drying Oven. (Elektrischer Kerntrockenofen.) E. Fr. Russ. *Die Giesserei*, Vol. 19, Dec. 23, 1932, pages 522-523. See *Metals & Alloys*, Vol. 3, Dec. 1932, page MA 359. Ha (23)

Experiments with Blast Furnace Gas Burners. (Versuche mit Hochofengasbrennern auf der Hütte Esch der Arbed.) M. Steffes. *Brennstoff- und Wärmewirtschaft*, Vol. 13, Mar. 1932, pages 231-234. Blast furnace gas is utilized for heating a water tube boiler of 100 m.^{2} heating surface and 12 atm. pressure. 5 different burners were tested; all worked satisfactorily, the best one yielding an efficiency of 65.5%. EF (23)

Coke Oven Gas for Ferrous Metallurgical Furnaces. (Koksofengas für Eisenhüttenöfen.) E. Maase. *Feuerfest-Ofenbau*, Vol. 8, Mar. 1932, pages 33-37. Combination of coke plants and blast furnace plants makes available large quantities of high-grade coke oven gas for steel plant use. No technical difficulties are encountered in changing to firing coke oven gas. Economy of transporting coke oven gas is discussed. Mixing of coke oven gas with blast furnace gas and producer gas is advised. Data on 6 principal commercial gases are compiled. Experience gained on use of coke oven gas is discussed fully with reference to open hearth furnaces, rolling mill furnaces, forges and annealing shops. EF (23)

On the Theory of Electric Arc Furnaces. A. Kholodoff. *Domez*, No. 6, 1932, pages 50-61. By developing well known diagram of furnace characteristics proposed by Riecke a new diagram was evolved. It has advantages of former simplicity and convenience in handling, but is free from its defects and lack of easy visualization of its values. Recalculation of all derivatives for working characteristics of furnace is not necessary. It permits finding graphically with speed and ease all data for working characteristics of moment of maximum rate of transformer and moment of maximum rate of furnace. Diagram was checked on performance of an electric arc Cu melting furnace. Considerable further development of subject from electrical standpoint is given. (23)

Precautions to be Taken to Increase the Life of Electric Furnaces. (Precautions à prendre dans la construction des fours électriques pour en augmenter la durée). Ch. Louis. *Journal du Four Electrique*, Vol. 41, Dec. 1932, pages 459-460. To take care of the destructive expansion and contraction of the brickwork it is advantageous to interpose between it and the shell of the furnace a layer 10-15 cm. thick of sand or other refractory pulverulent material. JDG (23)

Some Remarks on Steel Furnaces. (Quelques considérations sur les fours à acier). Serge Heuland. *Journal du Four Electrique*, Vol. 41, Nov. 1932, pages 417-418. Generalities about electric steel furnaces. JDG (23)

Material and Thermal Balance of a 3-phase, 900 KW. Ferromanganese Electric Furnace. M. L. Vinokur. *Domez*, No. 9, 1932, pages 32-41. (In Russian.) Performance of furnace was studied, and calculations of efficiency of operation were made. (23)

Suitability of Electric Furnaces for Work Shop. (Die Eignung der elektrischen Oefen für die Werkstatt.) H. v. Droste. *Werkstattstechnik*, Vol. 26, Nov. 15, 1932, pages 434-437. Distribution of heat, dependability, heat consumption, simple and hygienic operation are discussed. RFV (23)

Electric Furnaces in the Iron and Steel Foundry. W. S. Gifford. *Iron & Steel Industry & British Foundryman*, Vol. 6, Dec. 1932, pages 81-84. Description of electric melting and electric dry furnaces in the foundry. CHL (23)

REFRACTORIES & FURNACE MATERIALS (24)

Diatomite as a High Temperature Insulator. *Metal Industry,* London, Vol. 41, Aug. 5, 1932, page 132. Diatomite is a fine refractory material which will stand temperatures up to 3000° F. It does not fuse at this temperature. It is composed of silica, not affected by climatic influences, and can be made up in form of bricks, slabs, tiles, cement, etc. The bricks are used in furnaces as insulation, but they must not come in direct contact with the flame. Ha (24)

Protecting Weak Spots in Open-Hearth Furnaces. C. W. Veach. *Iron Age,* Vol. 129, Feb. 4, 1932, page 339, adv. sec. page 30. Quick repair of open-hearth furnace walls may be accomplished by use of a chrome-ore product mixed with water. Proper tools for applying material is a prerequisite. Best time to begin facing jambs is when wear on lower part of wall is sufficient to cause a noticeable overhang of upper part. VSP (24)

Canadian Basic Refractories. A. F. Gill. *Iron & Steel of Canada,* Vol. 16, Mar. 1933, page 36-37. Magnesian dolomite and magnesite in Quebec provide Canadian industries with refractories. OWE (24)

Blast-Furnace Linings. W. J. Rees. *Engineering,* Vol. 133, June 10, 1932, page 698. Abstract of paper read before Refractory Materials section of Ceramic Society, May 1932. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 55. LFM (24)

New Refractory—"Siemensit" will not Fuse at Cone 42. *Brick & Clay Record,* Vol. 82, Mar. 1933, page 88. Refractory is made from ferro-chrome furnace slag. Chemical composition of material is: chrome oxide 20-40%, magnesium oxide 18-30%, alumina 25-45%, other constituents 8-14%. Pyrometric cone equivalent is above cone 42 (2015° C. and 3659° F.). This material is exceptionally dense, undergoes drastic thermal shock with only slight spalling, and is resistant to both acid and basic slags. Refractory is produced either by fusing and casting or according to ceramic methods from pulverized slag. Better metal was produced from furnaces when slag composition was changed to secure better properties as a refractory. CBJ (24)

Refractories and Their Testing. *Chemical Trade Journal & Chemical Engineer,* Vol. 90, Apr. 29, 1932, pages 431-432. Abstracted from The Refractories Bulletin, Mar. and Apr. 1932. Use of Seger Cones and the Seger Cone Test are described. Refractoriness of fire brick depends upon the Al_2O_3-SiO_2 ratio, the purity of the clay, and the grain size. The ideal firebrick is derived from kaolinite. It analyzes 45.9% Al_2O_3 and 54.1% SiO_2, and has a refractoriness equal to Seger Cone 35. Impurities such as SiO_2, TiO_2, Fe_2O_3, CaO, MgO, and alkalies lower the refractoriness and are classed as fluxes. For severe service, firebricks high in Al_2O_3 and low in fluxes are recommended. JN (24)

Better Refractories Aid Blast-Furnace Practice. Ralph Sweetser. *Mining & Metallurgy,* Vol. 13, July 1932, pages 319-321. Cost of relining has greatly increased but life of a lining has also increased. Less than 5 years on a lining is considered a short blast. Latest development in refractory manufacture is hydraulic pressure and low moisture content known as "hydro-dry" process using pressure up to 3500 lbs./in.^{2} or more. Important changes in blast furnace refractories requirements are demand for greater density in checker brick for hot-blast stoves, hearth, bosh brick and for top brick. Excessive formation of salamanders can be prevented by use of denser firebrick. Possibility of gain in heat capacity of hot blast stoves without increasing their size or shape but by increasing weight of the checker brick. VSP (24)

Sidelights on Refractories in Open-Hearth Practice. R. Percival Smith. *Engineering,* Vol. 134, Oct. 21, 1932, page 472. Abstract of paper read before Ceramic Society, London, Sept. 1932. Deals with methods of reducing cost of refractories at the works of a British steel company, Messrs. Steel, Peech and Tozer, Ltd. LFM (24)

Cupola Linings. J. G. A. Skerl. *Bulletin British Cast Iron Research Association,* Vol. 3, Jan. 1933, pages 170-176. Linings of brick and of rammed materials were investigated, bricks or rocks are more prevalent in practice. Firebricks are more resistant to spalling or splitting by sudden changes of heat than are silica bricks and also to the action of slag. Alumina content must be high in order to make brick heat-resisting. Higher alumina content and nearer silica content approaches 100% the more satisfactory is the material from heat-resisting standpoint; satisfactory materials for cupola linings should have an alumina content of less than 7% or more than 25%, as the curve of refractoriness shows a steep minimum of less than 1000° C. at about 10% Al_2O_3. Influence of FeO on both firebricks and silica materials under reducing conditions is very great, firebricks are generally more resistant. Tables and curves of fusion points of FeO with aluminas and silicas are given. Good working conditions in a cupola are obtained when the refractoriness of the lining is as high as possible to resist the heat generated by the blast on hot coke, the slag is fairly high in lime, and the lining contains as little bonding material as possible. If the slag is highly ferruginous a highly aluminous brick is to be preferred. Ha (24)

Some Uses of Refractory Materials in the Foundry. J. G. A. Skerl. *Foundry Trade Journal,* Vol. 47, Dec. 15, 1932, pages 369-372. Paper deals successively with (1) cupola linings, bath brick, and rammed material, (2) coal dust, (3) blackings and plumbagos, and (4) molding sand. The composition and properties of cupola bricks are tabulated. The advantages and disadvantages of rammed linings are summarized, and need for extensive study of cupola refractories is emphasized. Use of coal dust in green-sand facing mixtures is discussed and best practice suggested. OWE (24)

Influence of Manufacturing Limitations of Magnesite Brick on Their Properties. (Einfluss der Herstellungsbedingungen von Magnesitsteinen auf ihre Eigenschaften.) K. Schnitzler. *Doktor-Ingenieur Dissertation, Technische Hochschule Aachen.* Published by Deutsche Keramische Gesellschaft, Berlin, 1933, 23 pages. *Berichten der deutschen Keramische Gesellschaft,* Vol. 14, 1933, pages 61-84. 3 sintered magnesites with 4.6, 6.5 and 8.2% Fe_2O_3 were subjected to different pressures and different firing temperatures and various properties studied at room temperature and up to 800° C. Usual conclusions as to effect of the variables were reached. HWG (24)

Corundum for Implements of High Chemical and Thermal Resistivity. (Sinterkorund als Material für Geräte von hoher chemischer und thermischer Widerstandsfähigkeit.) Hans Kohl. *Tonindustriezeitung,* Vol. 104, Dec. 22, 1932, pages 1266-1267; Dec. 29, 1932, pages 1279-1280. After giving a detailed account of chemical and physical properties of corundum fields of application are discussed. It is the most resistive crucible material known for glass and slag melts. For metallurgical purposes it is suitable for melting all metals and the corresponding slags, particularly for melting of Pb, Al and Mn-steels. It has successfully been used for conducting gases into Fe melts, for conveying of Al and light metals to press casting machines and similar purposes. GN (24)

Refractories and the Non-Ferrous Metal Industry. F. S. Russell. *Metal Industry,* London, Vol. 42, Jan. 13, 1933, pages 57-58. Review of developments; a closer coöperation between users of refractory materials and producers of refractories is advisable to eliminate difficulties in non-ferrous industry which are often due to the fact that the user does not state the actual problems in the reduction or refining of the metals or alloys to the refractory manufacturer. Ha (24)

Refractory Brick for Highest Requirements. (Hochfeuerfester Baustoff für stärkste Beanspruchungen.) Justus Schmauser. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Apr. 2, 1933, page 194. Discussion of laboratory tests and practical experiences with the new refractory Siemensit. By using Siemesit as open hearth furnace lining data show considerable money can be saved. GN (24)

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EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

Corrosion Experiments with Iron, Chromium and Nickel as Well as with Corrosion and Heat Resistant Alloys of These and Other Metals. (Korrosionsbestimmungen an Eisen, Chrom und Nickel, sowie an korrosions- und hitzebestandigen Leglerungen dieser und anderer Metalle.) R. MÜLLER, G. HALM & H. KRAINER. *Berg- und Hüttenmännisches Jahrbuch der Montanistischen Hochschule Leoben,* Vol. 80, June 10, 1932, pages 74-78. Electrolysis of fluoride melts, especially commercial production of Mg, requires highly resistant furnace material. Losses in weight after 6 and 15 hrs. exposure to fluoride bath at 950° C. were determined and yielded following results: Among 3 pure metals, Ni was most stable, corrosion attack/cm.^{2}/hour being: Fe = 34.6 mg., Cr = 23.8 mg. and Ni = 0.8 mg. (increases in weight). On Ni-samples a protective green film was noticed. Increasing C-contents in 14% Cr steels with 0.12, 0.40 and 2.2% C (0.5 Si and 0.4 Mn) at first accelerate corrosion attack, but an improvement starts near eutectic point. Austenite which is exclusively present at high testing temperature of 950° C. displays greatest corrosion stability. At higher C-concentrations, secondary cementite appears resulting in a decidedly harmful effect. At still higher C-contents, Ledeburite shows up which seems to render steel more stable. 6 pure Ni steels (0.15-0.4% C) with rising Ni-concentrations from 5.0-36.0% Ni proved to be more corrosion resistant the higher the Ni content. Si in plain C-steels improves corrosion resistance moderately. Cr + Ni materially improve corrosion stability. Best results were secured with a 40/19 Ni-Cr steel (0.15% C) which was slightly superior to a 70/20 Ni-Cr alloy although in general resistance to melt attack was cut down by rising Ni + Cr contents. Pickling of an 18/8 Cr-Ni steel accelerated corrosion and doubled loss in weight of untreated samples. This shows that under testing conditions stated above, pickling should be dispensed with. Cr-Ni steels with additions of Al, Mo, Cu, Co, Si and Al showed that Al exerts a distinctly beneficial effect, which is less pronounced when Mo + Cu are added. Replacing Ni by Co caused heavy corrosion. In summary it was established that by far the best corrosion stability was exhibited by pure Ni. EF (29)

With ever increasing temperatures and pressures==what?

These abstracts are prepared in cooperation with the Joint High Temperature Committee of the A. S. M. E. and the A. S. T. M.

Creep at Elevated Temperatures in Chromium-Vanadium Steels Containing Tungsten or Molybdenum. WILLIAM KAHLBAUM & LOUIS JORDAN. *Bureau of Standards Journal of Research,* Vol. 9, Sept. 1932, pages 441-455. Determinations of creep at temperatures between 750° and 1100° F. were made on 2 W-Cr-V and a Mo-Cr-V steel. These steels were tested as tempered after mechanical working and are compared with steels of similar composition which had been oil quenched and tempered. Comparison of 2 W-Cr-V steels show that appreciably higher stresses are sustained by steel of lower C content at 860°, 950° and 1000° F. before 0.1 or 1% creep results than is case with higher C steel. Also there is for lower C steel a wider range at 950° F. between stresses producing 0.1 and 1% creep than for higher C steel. Stresses producing 0.1% creep were appreciably higher for quenched and tempered W-Cr-V steel at 950° and 1000° F. than those for a very similar composition which was simply tempered after rolling. Simple Cr-Mo steel was found to have a very narrow working range for stresses producing 0.1% creep. WAT (29)

Tensile Properties of Cast Nickel-Chromium-Iron Alloys and of Some Alloy Steels at Elevated Temperatures. WILLIAM KAHLBAUM & LOUIS JORDAN. *Bureau of Standards Journal of Research,* Vol. 9, Sept. 1932, pages 327-332. Tensile properties as measured in "short-time" tests were determined for a medium-Mn steel at 900° F.; for a series of cast Ni-Cr-Fe alloys containing about 0.5% C, 35% Cr and from 10-45% Ni, at a temperature of 1550° F.; and for 3 W-Cr-V steels and 4 Mo-Cr-V steels at temperatures of 850° and 1000° F. Medium-Mn steel (1.08%) had a proportional limit of 15000-16000 lbs./in.^{2} at 900° F. This is fully 150° F. higher than temperature at which a 0.55% Mn boiler-drum steel of same C content (0.4%) possessed same proportional limit. Ni-Cr alloys showed no marked change in proportional limit at 1550° F. over range of composition studied. With Ni contents over 50% tensile strengths of alloys decreased noticeably and ductility increased. A medium-Mn content (1.02%) in one of the steels of W-Cr-V series was accompanied by proportional limits as high or higher than other steels in the series. Increased Mn contents (up to 1.4%) in Mo-Cr-V steels resulted in higher proportional limits at 850° and 1000° F. A steel having a still higher Mn content (2.23%) accompanied by high Si (1.33% and 1% Mo) had a high proportional limit at 850° F., but a comparatively low proportional limit at 1000° F. WAT (29)

Two Apparent Anomalies in the Protection of Pyrometric Thermo-Couples. (De deux Anomalies Apparentes dans la Protection des Couples Pyrométriques.) M. BAILLY. *Chaleur et Industrie,* Vol. 13, June 1932, page 435. In some instances Ni-Cr couple sheathings are rapidly destroyed when temperature does not exceed 1150° C. and sometimes 1050° C. Destroyed sheathing shows a little hole and there is a hollow in protecting tube near the hole indicating that metal has melted down and has flowed out through the hole. This fact is explained as follows: Due to shape of furnace roof, heat is chiefly concentrated on one spot of sheathing. This severe local heating causes melting down of metal. As in Ni-Cr alloys refractoriness is induced by a skin of highly refractory oxides, inside metal only is melted and the outside remains solid. FR (29)

The Electrical Resistance and the Critical Point of Mercury. FRANCIS BIRCH. *Physical Review,* Vol. 41, Sept. 1932, pages 641-648. Values are given for relative resistance, instantaneous pressure coefficient of resistance and instantaneous temperature coefficient of resistance of liquid Hg in region between 0° and 1200° C., and 1 and 4000 atmospheres. All of these quantities increase with rising temperature and decrease with rising pressure in this region. With assumption that resistance must be a continuous function of temperature, for pressures higher than critical pressure, critical constants of Hg have been determined as 1460 ± 20° C. and 1460 ± 50 kg./cm.^{2} WAT (29)

Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys. Report of A.S.T.M. Committee B-4, DEAN HARVEY, Chairman. *Preprint* No. 21, June 1932, *American Society for Testing Materials,* 3 pages. Includes reports of subcommittees. A new Subcommittee (VII) on Thermostatic Metals, P. H. Brace, Chairman, has been organized and a survey of definitions and test methods has been undertaken. Progress reports on problems not yet finished. VVK (29)

REDUCTION METALLURGY (31)

Sintering at Coniston. A. G. ROACH. *Canadian Mining & Metallurgical Bulletin,* No. 248, Dec. 1932, pages 724-742. Sintering plant for treating heavy sulphide ore containing chalcopyrite, pentlandite and nickeliferous pyrrhotite is described. AHE (31)

Recent Improvements in the Greenawalt Sintering Apparatus. J. TORNBLAD. *Engineering,* Vol. 133, June 17, 1932, pages 725-727. Condensed from paper read before the Iron & Steel Institute, May 5, 1932. See *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 91. LFM (31)

Experimental Sintering of Tshiaturi Manganese Ore at a Metallurgical Plant in Luebeck, Germany. W. I. KOTOFF. *Domez,* No. 6, 1932, pages 16-19. (In Russian). Washed fine ore containing 51.11% Mn and 6.48% SiO_2 treated in a Dwight-Lloyd machine, speed of belt 850 mm./min., gave a strong porous sinter. 8% coke breeze appeared to be too much, while thickness of charge on belt, 300 mm., might have been increased to advantage. Total losses were under 5%. Many mchanical troubles connected with use of raw ore do not recommend this material. (31)

The Sintering of Raw Materials for Blast-Furnace Charges. (L'Agglomération des Matières Premières pour le Lit de Fusion des Hauts Fourneaux.) N. SAINDERICHAIN. *Chaleur et Industrie,* Vol. 13, June 1932, pages 403-406. For producing good agglomerates economically following conditions must be fulfilled: (a) transformation of Fe_2O_3 into Fe_3O_4, (b) frit but not slag, (c) size of agglomerates as regular as possible and with sufficient strength. Reasons are given why processes used heretofore have not filled all those conditions. In new "Foll-sain" process, sintering is obtained in a rotating furnace by progressive action of heated air on a mixture of crushed ferrous materials and coal moving along the furnace and strongly heated at 650° to 800° C. only over a short length of the furnace near the end where porous agglomerates are ejected from the furnace. FR (31)

Fuel Economy in Larger Blast Furnaces. ROY P. HUDSON. *Iron Age,* Vol. 130, Aug. 18, 1932, page 254. Present day larger blast furnaces are not as economical with fuel as smaller furnaces. Average sized hearth should consume 6000 lb. of coke/ft.^{2} in 24 hr. The fuel capacity of blast furnace of Southern Ohio Pig Iron & Coke Association was 60 lb. of coke/24 hr./ft.^{3} of working volume, which is volume from center line of tuyeres to 2 ft. below closed bell. VSP (31)

Most Iron Reduced Below Tuyere Level. Correspondence from JULIUS STOECKER. *Metal Progress,* Vol. 21, June 1932, pages 59-60. Brief report on conclusions reached from analysis of 1100 samples of gaseous and solid matter drawn from different zones of blast furnaces producing basic Fe in plants of Bochum Steel Works. Free O was found 2 feet in front of tuyeres (hearth diameter, 13 ft., bosh widened upward from 17 feet to diameter of 23 feet). CO reached its maximum 15" from wall; none occurred 3 feet inside. CO_2 first appeared after CO has passed maximum; at center it comprised 40% of gas. C content at upper tuyere level was about same as in tapped Fe (4.1% C). As Fe passed through incoming blast, C was reduced to 1%, but this loss was recovered by time metal reached slag tuyere level. Slags drawn from regions in front of operating tuyere contained 40-50% Fe. At level of slag notch, it dropped to 2%. WLC (31)

Breakouts in Blast Furnace No. 1 at Mariupol Works in 1931. N. W. KLISHEWITCH. *Domez,* No. 6, 1932, pages 25-29. (In Russian.) First breakout occurred about 1 year after blowing in. It was not preceded by any abnormalities in running of stack. After re-laying of hearth, furnace was started again. In 30 days another breakout occurred. Furnace was functioning normally till the accident. Cause appears to lie in poor quality of brick. (31)

Adsorption of Platinum Metals by Active Carbon. (Die Adsorption von Platinmetallen durch A-Kohle.) H. WOELBLING. *Angewandte Chemie,* Vol. 45, Nov. 12, 1932, pages 720-721. Active C is excellent for separating Pt from dilute solutions of complex Cl-compounds; the same, although not to the same degree in all cases, was found for Pd, Os, Ir, Ru and Rh. This process seems promising for concentration of poor ores. Ha (31)

If You Smelt Ores

Here Are New Ideas for You.

Polycowper, a New Hot Stove for Blast Furnaces. V. P. MASHOWETZ. *Domez,* No. 1-2, 1932, pages 21-26. (In Russian.) Assuming radiation loss of a standard hot stove as 15%, it was calculated that uniting 4 hot stoves in a single jacket will reduce this loss to 7.5%, and 8.5% when 3 are put together. Steel jacket is subdivided into compartments by double air tight steel partitions, each corresponding to an individual hot stove of standard design. Space between double walls is cooled by air which is then passed into sector under blast. Compactness of installation with the corresponding savings in equipment cost is emphasized. Structural details are given. (31)

Single Control Panel for Scientific Operation of Blast Furnaces. (Installation d'un poste de commandement unique pour l'exploitation scientifique des Hauts-fourneaux.) DERCLAYE. *Revue de Métallurgie,* Vol. 29, Aug. 1932, pages 389-419. Efficient operation of a blast furnace is facilitated when data regarding important variables are constantly available. On control panel which has operated for several years are segregated temperature recorders for stack and every hot stove, stock line indicator, pressure and volume gages and other apparatus giving desired information about furnace at any given moment. Hot stoves are operated from it by means of pneumatic system acting on valves. Berg and Brosius mud gun is described. JDG (31)

Heat Transfer from a Gas Stream to a Bed of Broken Solids. C. C. FURNAS. *United States Bureau of Mines, Bulletin* 361, 1932, 88 pages. A formula for coefficient of heat transfer (heating and cooling) from a gas stream to a bed of broken solids is developed. AHE (31)

Some Experiments on Injection of Blast Furnace Dust in the Stack of a Blast Furnace. A. P. GERLEMEN, I. A. NEKRASSOV, G. G. ORESHKIN & I. K. TROFIMOV. *Domez,* No. 9, 1932, pages 4-17. (In Russian.) For 21 days from 51 to 183 tons/day of blast furnace dust was injected in the stack of a 250 ton blast furnace 7 m. above the boshes using an air compressor giving a pressure of 2 atmospheres and with a capacity of 600 m.^{3}/hr. The temperature at the injection zone was lowered. The use of dust reduced coke consumption by 7.2%, Fe ore 5.0% and fluxes 4.9%. (31)

NON-METALLIC COATINGS FOR METALS & ALLOYS (32)

An Example of Long Time Service of Baked Enamel Coatings on Water Pipe. A. H. SABIN. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 666-669. Baked enamel coating consisting of gilsonite with about 50 to 55% linseed oil was applied to a 10-mile pipe line, 5 ft. in diameter, as part of city water supply for Allegheny, Pa. (now Pittsburgh) in 1895. Enamel was baked on at 400° F. for 2 hours. Coating is still in first class condition and is said to be good for 30 years more. Same coating applied in same year to 5 miles of 40" steel pipe for Cambridge, Mass., is also still in good condition. VVK (32)

Gas Industry Discusses Technical Problems. Editorial Staff Report. *Chemical & Metallurgical Engineering*, Vol. 39, Nov. 1932, pages 609-610. For the first time at the American Gas Association meeting held at Atlantic City there was a report on use of a soil survey showing that measurements of soil resistivity is a reliable means of determining rate of attack of pipe lines. Seven conclusions that relate to tests of coating of underground pipe lines are: the protective value of a coating depends primarily upon nature of coating and to a minor extent upon the soil; when a coating fails, the pitting rate depends upon the soil; the electrical conductance and pinhole tests are useful methods for determining the protective value of coatings; the protective value of coatings is increased by increasing the thickness, within certain limits; mechanical distortion after application is the principal cause of bituminous coating failures; organic reinforcement materials are decomposed by bacteria and fungi in the soil and the extent of this decomposition or rotting depends upon the nature of the soil and upon the extent to which the materials are protected with bitumens or disinfectants; thin, or what might be termed paint, coatings do not add enough to the life of the pipe to justify their use. PRK (32)

On the Reduction of Manganese in the Blast Furnace. (Zur Reduktion des Mangans im Hochofen.) FRITZ WÜST & HANS HEINZ MAYER. *Stahl und Eisen*, Vol. 52, Sept. 15, 1932, pages 893-897. Report 129 of Blast Furnace Committee of Verein deutscher Eisenhüttenleute. Through a series of pig Fe-basic slag melts, it was demonstrated that equilibrium set up in these melts had approximately same K_{Mn}-values as for melts of steel and slag. Past investigations almost conclusively show that, at temperatures up to 1600° C., higher C-content of pig Fe does not have any appreciable effect on equilibrium. A consideration, from this point of view, on blast furnace practice, indicates that an equilibrium between pig Fe and slag actually never exists. The K_{Mn}-values are smaller throughout. Analytically determined FeO-content of numerous blast furnace slags is, without exception, considerably higher than FeO-content corresponding to equilibrium condition. It follows that a reduction of Mn from slag cannot take place. Mn reacts with FeO, and there is a resultant decrease in amount of Mn absorbed by metal above tuyere level. There is a possibility of a limited Mn reduction below the tuyere plane, that is, only in the center of the air blast-tuyere level, where no FeO is formed by the oxidizing gaseous atmosphere. 16 references. DTR (31)

Synthetic Japanning Lacquer. (Synthetischer Japanlack.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 15, 1933, page 36. Japan-like artificial resins of high viscosity can be processed according to investigations by Scheiber, by heating phenols with unsaturated high-molecular sebacic acids or mixtures of such acids in presence of metal chlorides which act condensing ($ZnCl_2$, $AlCl_3$, etc.). New method gives products of good solubility in hydrocarbons, alcohols and esters. GN (32)

Protection of Automobile Lacquers against Destructive Effects of Ultra-violet Light. (Schutz von Kraftwagenlackierungen vor der zerstörenden Wirkung des Ultraviolettlichtes.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 15, 1933, page 39. Durability of automobile lacquers which are easily destroyed by ultraviolet rays can be increased by using a lacquer essentially containing cellulose esters + 20-50% of a softening compound + .25-10% of a medium such as diphenyl benzol and diphenylguanidin to absorb the ultraviolet rays. GN (32)

Stable Lead Ochre Paint. (Dauernd haltbare Bleimennigefarbe.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 15, 1933, page 39. Oil-lead ochre paints as used for coating Fe have disadvantage of thickening due to chemical reaction of PbO with linseed oil sebacic acids. Investigations by Blumer (German patent No. 557022) show that a stable Pb ochre can be processed by using as binder solutions of Dammar wax in organic solvents. A suitable composition is 40 parts of Pb ochre and 20 parts of a 50% Dammar wax solution in benzine and benzol (1 : 1). GN (32)

The Principal Working Stages and Equipment in Enameling. (Die hauptsächlichsten Arbeitsgänge und Einrichtungen beim Emaillieren.) *Sprechsaal für Keramik, Glas, Email*, Vol. 65, Nov. 3, 1932, pages 792-794. This 3rd instalment deals with melting of enamels and enameling furnaces of which a great variety of types is described; their efficiency is discussed. Rotary furnaces give a most uniform enamel. GN (32)

Application of Finishing Materials on Zinc. MILFORD H. CORBIN. *Industrial & Engineering Chemistry*, Vol. 25, Jan. 1933, pages 32-34. Several theories attempting to explain breakdown of coatings on Zn are discussed. It is claimed that real cause of failure of coatings is chemical and due to high electropositive character of Zn. If cause is chemical action between paint film and the Zn surface, solution, it is thought, should be sought in (1) incorporating an inhibitor into the paint, or (2) in changing the nature of the Zn surface. Suggestions are offered towards solving the difficulties. MEH (32)

S-D-0, New Corrosion-Resisting Coating. O. M. HAYDEN. *Industrial & Engineering Chemistry*, Vol. 24, May 1932, pages 563-564. S-D-0 is a synthetic drying oil, that hardens by polymerization and forms films that are unaffected by action of all solvents and most corrosives. It can be used as a coating on metal surfaces if surfaces are first roughened; it will not adhere to smooth or dirty metal. Acids and alkalies have no effect except to cause darkening, while corrosive vapors in absence of moisture have no effect. S-D-0 is attacked by strong oxidizing agents, such as concentrated H_2O_2, chromic acid, HNO_3 and hot H_2SO_4. HF penetrates it but does not destroy the film. Completely polymerized S-D-0 will withstand temperatures up to 200° C. without change. MEH (32)

Weather Resistant Covering for Line Wires. C. F. HARDING, L. L. CARTER & J. W. OLSON. *Transactions American Institute Electrical Engineers*, Vol. 51, Sept. 1932, pages 635-639. It is suggested to improve the present triple braid, weather resistant insulation for high-tension wires by use of higher fusing point blown asphalts, free of waxes and low boiling fluxes, as a saturating material for the jute and cotton braiding; this will increase corrosion resistance. Ha (32)

Adherence of Bright Ground Coats on Iron Sheet. (Haftung von hellem Grund auf Eisenblech.) EISENLOHR. *Emailletechnische Monatsblätter*, Vol. 9, Jan. 1933, pages 1-6. After a general discussion of reasons for adherence of enamels on Fe sheets and adhering oxides used, results of comprehensive investigations are reported. (1) Adherence of bright coat investigated is considerably affected by milling time. It reaches an optimum at about 30% sieve residue on the 10,000 mesh-sieve. (2) ZrO_2 when added while melting enamel promotes formation of properly adhering layers and increases impact strength. (3) "Firmusoxide" (a compound of several constituents composition of which has been found by systematic empirical tests) when added to milling batch promotes adhering action and prevents rusting. (4) Borolith (a Na-Ca silicate) favorably affects elastic properties. (5) Metal precipitations, according to Eyer a reason for adherence, could not be proved. If they should occur under certain circumstances, they are of but secondary importance for adherence. (6) Both pickled and non-pickled sheets can be used for bright enamels. (7) Firing temperature and duration are of great importance for good adherence. GN (32)

Measurement of Electrical Conductance of Pipe Coating Important in Study of Protection. E. R. SHEPARD. *Oil & Gas Journal*, Vol. 31, Sept. 29, 1932, pages 100-104. To measure electrical conductance of pipe coatings author has developed a test set by which a constant potential of 3 volts, or up to 30 volts for high resistances, is applied to coating under test and measurements taken on 2 current-indicating instruments. Resistances from 7 to 1000 ohms are covered by 2 ranges on milliammeter and resistances above that range by 4 ranges on microammeter. Measurements can be made in field and technique is adequately described. VVK (32)

Researches on the Anodic Behavior of Al. II. Anodic Behavior of Al in Aqueous Solutions of Oxalic Acid. SH. SETOH & A. MIYATA. *Scientific Papers Institute of Physical & Chemical Research*, Tokyo, Vol. 19, Sept. 30, 1932, pages 237-291. The thin active Al_2O_3 layer is more or less porous due to a uniform destruction by anions of the electrolyte. Nascent O due to the electric discharge in the pores violently combines with Al thus forming a new active layer continuously. Using constant current densities, the rapid growth of the active layer in the beginning of the electrolysis scarcely depends on the kind of electrolyte employed. The factor counteracting the voltage rise is specific to the anion in solution. O gas occluded in the active layer pores prevents direct contact between base metal and electrolyte and keeps Al from going into solution. The gas liberated at the anode mainly consists of O, slightly mixed with CO_2 (due to the oxalic acid oxidation) and H_2 (due to dissolution of Al). This gives evidence of a pure oxidation process occurring almost exclusively at the anode and dismissing the theory of bulky $Al(OH)_3$ precipitation. The anodic behavior of Al in various electrolytes depends solely on the delivery of electron which is supposed to be specific to the anion in solution as previously proposed by G. Schulze (*Annalen der Physik*, Vol. 21, 1906, page 929). Such anion which contains an element of being an electric conductor in itself as oxalic acid, chromic acid, etc., is liable to destroy active layers with comparative ease and consequently their critical voltages become low and indefinite. WH (32)

New Metal Protection. (Der neue Metallschutz.) J. RAPPAPORT. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Apr. 15, 1932, pages 177-178. Amber and congo copal in metal lacquer industry. Parabenol as new metal protection means and its application. EF (32)

The Importance of Color Pigments for Rust Protective Paints. (Die Bedeutung der Buntpigmente für Rostschutz-Deckanstriche.) H. RASQUIN. *Oberflächentechnik*, Vol. 9, Dec. 6, 1932, pages 240-241. If in addition to rust protection a more decorative effect is desired colored coats should be always employed over a good rust-proof coat with white Pb or a similar material as base. Then colored coating does not need to be rust-proof. Properties and compositions of such coatings are discussed. Ha (32)

Preservative Coatings for Structural Materials. Report of A.S.T.M. Committee D-1, ALLEN ROGERS, Chairman, *Preprint* No. 64, June 1932, *American Society for Testing Materials*, 36 pages. Includes reports of subcommittees. Tentative specifications for shellac varnish, ethylene glycol mono butyl ether, ethylene glycol mono ethyl ether, acetate ester of ethylene glycol mono ethyl ether, and a method of test for comparative hiding power of paints; proposed tentative revisions of methods of routine analysis of paint pigments. VVK (32)

Varnish and Carrier. (Lack und Untergrund.) U. RETZOW. *Farbe und Lack*, Jan. 2, 1932, pages 5-6. Mild steel was coated with (a) colorless celluloid lacquer, (b) intermediary Cd layer (10 min.) + Ni plating (15 min.), (c) intermediary Cu layer + Cd plating. One-half of samples (b) and (c) was provided with a celluloid lacquer coating. After being exposed for 6 months to atmospheric corrosion sample (a) proved that celluloid lacquer does not furnish a sufficient protection. Samples (b) and (c) showed a satisfactory stability due to electro-plating. Electro deposited metals however did not preserve their initial state. This drawback could be entirely eliminated by a celluloid lacquer film which hermetically seals platings underneath. Recent investigations in the Aero-Hydrodynamic Institute Moskow (J. Andreef) along similar lines are reviewed. EF (32)

Comparative Tests on Spray-Guns. (Vergleichende Versuche mit Farbspritzpistolen.) P. NETTMANN. Veröffentlichungen des Fachausschusses für Anstrichtechnik, Heft 1. VDI Verlag, Berlin, 1932. Paper 9 x 12 inches, 24 pages. Price 3.50 R.M. After a brief summary of various methods of applying coatings, physical fundamentals of spray process and development of individual systems for spray-guns are discussed in detail. A critical description of different parts of the apparatus is given, its best application is shown. Results of comparative tests are given in tables and diagrams. Next, various apparatus designed for absorbing inevitable spray-dust are reported. Instructions on care and maintenance of spray apparatus are added. In second part of booklet, general tasks of painting technique are reviewed. G. Goldbach (32)-B-

Recent Developments in Metal Lacquers. KENNETH R. LONGNECKER. *Metal Industry*, N. Y., Vol. 30, Dec. 1932, pages 475-476. From *Monthly Review of American Electroplaters Society*, Oct. 1932. Among developments of interest are (1) pearl finish and imitation plated finish, (2) synthetic resins and their use in enamels and clear lacquers, (3) decorating of Cr (4) spotting out retarding lacquers. Pearl essence which gives mother of pearl or metallic effect is made from guanin, a small crystalloid formation emanating from internal organs of fish. Lacquer is formulated from 6 oz essence, 20% pigmented automobile enamel, 80% weather resisting clear lacquer, per gallon. For outdoor exposure only thin films of lacquer should be used otherwise premature failure occurs. No lacquer has as yet been made that eliminates spotting but there are several good lacquers that retard growth of annoying spots. PRK (32)

Classification of Color Spraying Methods and Spraying Devices (Leistungsbewertung von Farbspritzverfahren und-pistolen). R. KLOSE. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Nov. 12, 1932, page 1133. It is attempted to find certain rules and working methods by which capacity of a color spraying device can be judged and eventually standardized. A few tests were made to find energy consumption to spray guns for different air pressures; curve is reproduced. Ha (32)

New Iron Oxide Anti-Rust Paint. ("Gasrot"; eine neue Eisenoxyd-Rostschutzfarbe. H. A. BAHR & M. BRÄUTIGAM. *Farbe und Lack*, Aug. 3, 1932, page 392. Fe ores are exposed at 475° C. to gases containing CO, yielding extremely fine Fe-oxide pigment. Corrosion stability is based on absence of S and liquid "aggressive chemical reagents" and on denser packing of new product in contrast to globular precipitated pigments which are built up by equally sized particles thus leaving much space between individual particles. EF (32)

Waterproof Coatings. (Wasserfeste Anstriche.) A. V. BLOM. *Oberflächentechnik*, Vol. 9, Dec. 6, 1932, pages 243-244. Continuous action of water on paints with a base of red Pb and bitumen were investigated. The latter usually gave reliable protection, especially if pigmented with Al-pigment. Ground coat must be carefully selected, especially for wood. Testing methods are briefly mentioned. Ha (32)

Red Lead or Iron Oxide as Rust Protection Means. (Bleimennige oder Eisenoxyd als Rostschutzmittel.) H. HEBBERLING. *Farbe und Lack*, Mar. 23, 1932, pages 161-162; Apr. 6, 1932, pages 182-184. Physico-chemical behavior of Fe and Pb oxide as rust prohibiting base material is critically discussed. Writer strongly warns against application of cheaper Fe-oxide, which shows considerably shorter life, causes higher maintenance costs, does not give a sufficient rust protection and does not furnish a "cheaper anti-rust protection means." EF (32)

The Technique of Vitreous Enamelling. J. E. HANSEN. *Sheet Metal Industries*, Vol. 5, Jan. 1932, pages 635-36, 641-42; Apr. 1932, pages 828-832; Vol. 6, May 1932, pages 31-36; June 1932, page 99; July 1932, page 174. Application of enamels by dipping and spraying methods is discussed. Drying of enamels in warm air and muffle driers is covered. Brushing and complete burning methods are set forth, together with general remarks on inspection. Value of inspection charts is shown, in that they give an efficient check-up on each department. Methods of applying grained finishes and equipment used are discussed. AWM (32)

MANUFACTURERS' LITERATURE

Lubrication of Rolling Mill Equipment

A 16-page pamphlet from E. W. Bliss Company will be found useful in the selection of lubricants by the operators of mills. Different types of their rolling mill equipment are illustrated and the proper grease or oil suggested for it. (212)

The Romance of Carborundum

A most interesting little booklet has been issued by the Carborundum Company. In it is told the story of carborundum from its beginning in 1891 to the present when its annual production is 30,000 tons. (213)

Wrought-Iron

A booklet from the A. M. Byers Company entitled "The Vital Element" is an elementary discussion of the manufacture of wrought iron, the "vital element" being iron silicate. The company is also prepared to furnish more technical pieces of literature, each devoted to specific problems. (214)

Potentiometer Controller

The extreme sensitivity and economy of their potentiometer controller are discussed in a folder sent out recently by the Foxboro Company. (215)

Hardness Testing Machines

Bulletin 1130 from the Gogan Machine Corporation describes Brinell and diamond type machines suitable for testing any material or shape. They have magnetically operated direct reading depth gages and other patented features. (216)

Valves

The Hanna Engineering Works has prepared a folder describing their "Unitite" valve which has withstood 300,000 reversals under actual operating conditions without appreciable wear. (217)

Steel Book

Joseph T. Ryerson & Son, Inc. have just published a new and complete stock list. It is a 232-page book and includes information and data on special grades of cold finished steels, alloy steels, stainless steels as well as brass, copper and other non-ferrous metals. (218)

High Speed Steel

The Firth-Sterling Steel Company has issued a booklet which discusses two of their high-speed steels. Blue Chip steel, a standard in this field, and Circle C, a super high-speed steel, recommended for heat treated alloy steels, chilled steel castings, hard bronze and similar materials beyond the normal cutting capacity of the standard cutting steels. (219)

Molybdenum

A well-printed, attractive 50-page booklet, "Molybdenum in 1933," has been published by the Climax Molybdenum Company. The scope of the book may be judged by the chapter headings—Properties Imparted to Steel by the Addition of Molybdenum, Commercial Molybdenum Steels, Steel Castings, and Molybdenum in Cast Iron. The data which has been assembled will be found most interesting and valuable. (220)

Nichrome

Bulletin R-33 of the Driver-Harris Company is an attractive, 60-page booklet wrapped in cellophane. It has been compiled to give the properties and characteristics of alloys for electrical, mechanical and chemical purposes and includes descriptions and applications of their Nichrome, Hytemco, Manganin, Lucero and nickel steels. Useful tables and data will be found in the last section of the catalog. A charge of 25c is made for this booklet. (221)

Muffle Furnace

A folder descriptive of their muffle furnace type MP has been issued as Bulletin 833 by the Cooley Electric Furnace Company. This is one of their bluehead furnaces and is designed for continuous operation at 1750° F. and for intermittent operation at 1850° F. It is recommended for enameling, heat treating, fusions, ignitions, etc. (222)

Weld Timer

A leaflet from the Electric Controller & Mfg. Company describes their automatic weld timer for resistance welders. It is recommended for producing identically uniform welds and for improving the surface of the finished product by reducing discoloration and indentation. (223)

Furnaces

Those interested in the cost of operating an electric furnace will find the figures for a 3 ton per hour top charge Lectromelt furnace in a leaflet prepared by the Pittsburgh Lectromelt Furnace Corporation for distribution at the Century of Progress World's Fair. The figures given are based on a monthly output of 1800 tons of small ingots when the furnace power costs $0.005 per kwh. (224)

Nickel and Its Alloys

The most recent in the series of Technical Bulletins issued by the International Nickel Company gives test data and service records which show that at room temperature caustic solutions of all concentrations have practically no effect on nickel or Monel metal. Nickel is also resistant to fused caustic, and nickel cast iron is many times more resistant than plain cast iron. (225)

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Painting Sheet Metal

Bulletin No. 16 from the American Chemical Paint Company is a very complete discussion of the preparation of sheet metal for painting. Photomicrographs show the various stages in the rusting of steel. (226)

Lead Pipe

The latest issue of the Dutch Boy Quarterly, published by the National Lead Company, features an article on lead pipe for interior plumbing systems. An interesting article entitled "Pewter—Today and Yesterday" will also be found in this issue. (227)

Cadmium Plating

The Grasselli Chemical Company is distributing reprints of an article entitled "Beauty and Utility in Cadmium Plating." (228)

Melting Furnaces

A folder distributed by the Monarch Engineering & Mfg. Company illustrates their soft metal melting furnaces. Coal, oil and gas fired types are shown. (229)

Pipe and Tubes

Price List No. 2 from the National Tube Company covers a series of stainless, corrosion and heat resisting steel pipe and tubes adapted to many uses in the manufacturing, chemical, oil refining, and other industries. (230)

Alloys

In the August issue of Better Castings, published by the Niagara Falls Smelting & Refining Corporation, will be found a list of the company's aluminum and aluminum alloys in ingot or shot form, hardeners, fluxing alloys and special alloys for use in castings. (231)

Dolomite Refractories

Basic Dolomite, Incorporated, has issued a most interesting and attractive pamphlet which presents the case of Clinkered versus Calcined Dolomite in the Basic Open Hearth Steel Furnace. The conclusion reached is that the clinkered product is more economical and in addition provides an easier working furnace and closer control upon refining. (232)

Furnaces

An attractive booklet from the R-S Products Corporation presents photographic reproductions of some of the industrial heating problems which have been solved by that organization. Each illustration, of which there are thirty, represents some radical improvement in industrial heat treating equipment. (233)

Artificial Furnace Atmosphere

The Ajax Electric Company is distributing an 8-page article describing the technical and economical advantages of dissociated ammonia gas (75% hydrogen, 25% nitrogen) for use in industrial furnaces and other equipment requiring a reducing atmosphere. (234)

Lead For Industry

An interesting and informative series of 12 data sheets pertaining to the properties of lead is being prepared by the St. Joseph Lead Company. To date, 8 of these are available and they will be mailed free of charge to consumers of lead. Those inquiring will be placed on file to receive future data sheets as prepared. (235)

Nickel Alloy Steels

Another useful chart has been prepared by the International Nickel Company, this one being devoted to nickel alloy steels for bars, shafting, simple forging, etc. By setting the chart at the required size and the desired yield point one can read off the recommended steel, its treatment and approximate properties. (236)

Chemical Resisting Steel

Bulletin S-66 from the Allegheny Steel Company gives physical data on their Allegheny 66, a chromium alloy steel with high resistance to most chemicals. A table is given which indicates the degree of attack which may be expected from the most generally used chemical reagents. This steel is available in a number of shapes and sizes, a list of which is given. (237)

Cadmium Plating

Udylite is the trade-mark name applied to a process of electroplating with cadmium for protection against rust, corrosion, etc. A description of the process, the necessary equipment and some of its applications will be found in a pamphlet issued by the Udylite Process Company. (238)

Modern Melting Methods

A 47-page booklet, Catalog No. 215, prepared by the Whiting Corporation will be found to be a most complete treatise on melting methods, discussing the furnaces used, charging methods and the applications of pulverized coal in the foundry. (239)

Tantalum

A folder from the Fansteel Products Company, Inc., advocates the use of tantalum for pipes, coils, tank linings, agitators, etc. This is, for all practical purposes, a corrosion proof metal, being inert to all corrosives except hydrofluoric acid, hot concentrated caustic or boiling concentrated sulphuric acid. (240)

Enameling Zinc Die Castings

A small mimeographed pamphlet from the New Jersey Zinc Company outlines the process of preparing the surfaces of rolled zinc and zinc die castings for lacquering and enameling. No particular finishing system is given because this should be adapted to the individual case. (241)

Welding Rods

A leaflet sent out by the American Brass Company describes their Anaconda welding rods for bronze-welding. (242)

METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

I should like a copy of each piece of Manufacturers' Literature listed below.

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Name.....

Position..... Firm.....

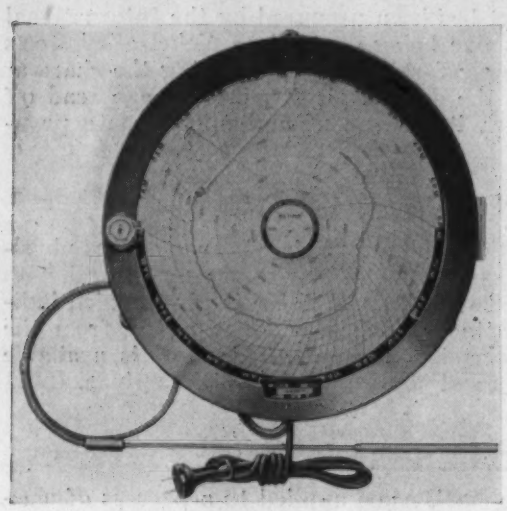
Street and Number.....

City..... State.....

NEW MATERIALS and EQUIPMENT

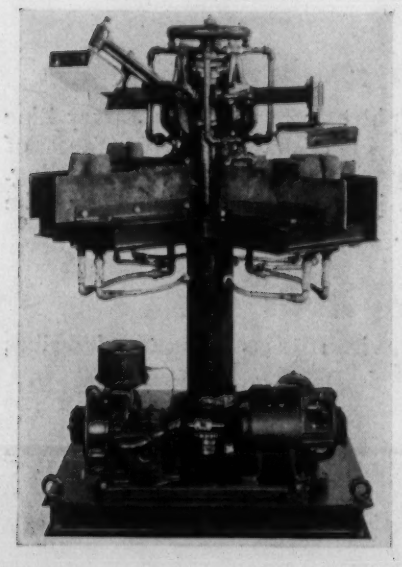
New Recording Thermometer and Pressure Gage

An entirely new and improved line of 8" and 12" circular chart instruments has just been placed on the market by The Brown Instrument Company, Philadelphia, Pa. These instruments include thermometers in indicating and recording types for temperatures from -40° up to 1200° F., and indicating or recording pressure and vacuum gages for ranges from 10" of water up to 5,000 lbs. All types are offered in one, two or three pen models. The mercury-filled helix is built of a special stainless steel which stands 100% overload and provides a surplus of power to move the pen. The gas and vapor type helices are made of heat treated phosphor bronze which gives greatly increased ruggedness and power. These thermometers may be located at distances up to 200 ft. In the pressure and vacuum gages, 3 different types of actuating movements are employed. For ranges 10 inches of water to 30 lbs., a flexible metal diaphragm is used. For ranges 30 and 200 lbs., a spring-opposed bellows has been developed which gives a powerful pen action in this range. For pressures over 200 lbs., a helix is used. An electric clock eliminating hand winding daily, is standard at no extra cost for all models. Where A.C. current is not available, hand-wound clocks are furnished. Cases are of die cast non-corrosive aluminum and are interchangeable for back or bottom connection or for flush panel mounting, permitting unlimited flexibility in installation.



Automatic Gas-Fired Heating Machine

An automatic gas-fired annealing machine for spot heating steel parts up to two feet in diameter and for work of an allied nature has recently been developed by The Selas Company, Philadelphia, Pa. The machine is a self-contained power-driven unit carrying 8 adjustable burners supplied with gas premixed with air. Individual adjustments of the burners and locating fixtures are provided, which allow the burners to be placed in any desired position, with relation to the piece being heated. Each burner is equipped with a manually operated shut-off cock in addition to the automatic throttling valves which control the heating cycle. Insulating refractory baffles reflect the heat down upon the work, accelerating the rate of heating and localizing the heated areas. The work is fed into the machine by the operator and is delivered at the rate of six pieces per minute. The machine rotates continuously from left to right, the burners being turned on and throttled down, and the baffles moved in and out of the operating position automatically. Power is secured from a small geared motor direct connected through a flexible coupling with the main driving shaft. The machine has a wide range of adjustment and can be readily adapted to handling either flat or formed pieces. It has successfully replaced oxy-acetylene torches on high production work. The particular advantages claimed over previous heating methods are a 50% reduction in labor, increased production, a very substantial saving in fuel costs, and a perfectly controlled and uniform heating.



Aluminum Flux

A new all-purpose aluminum welding flux, Oxweld Aluminum Flux, is announced by The Linde Air Products Company, New York, N. Y. This new flux is intended to replace the two fluxes previously marketed, one for welding pure aluminum and the other for welding aluminum alloys. The new flux is packed in ¼-lb. jars which in turn are packed in neat cardboard cartons.

Improved Bessemer Screw Steel

Jones & Laughlin Steel Corporation, Pittsburgh, Pa., claim that practical applications of its improved bessemer screw steel have shown production increases ranging from 11% to 99%. While this improved stock has just been offered to the trade, it has been in use, for purposes of performance observation, for a number of months. It is made in both S.A.E. 1112 and high-sulphur grades.

As described by the manufacturer, this is not a new stock, since its chemistry and physical properties are unchanged. Its free-cutting quality, however, through an advance in manufacturing method, has been improved radically.

The increases in production reported are ascribed to one or both of two factors. Either machining time is reduced, or tool life is extended, or both. Less energy is required in cutting and tools retain good cutting edges for longer periods. Machine time is reduced either through an increase in feed or speed, or both.

An improvement in the quality of the finished parts has been reported, too. With less energy exerted through the tool, the tearing action is minimized; there is less destruction and deformation of the metal and, in consequence, a finer finish is obtained.

CHEMICAL SPECIFICATIONS

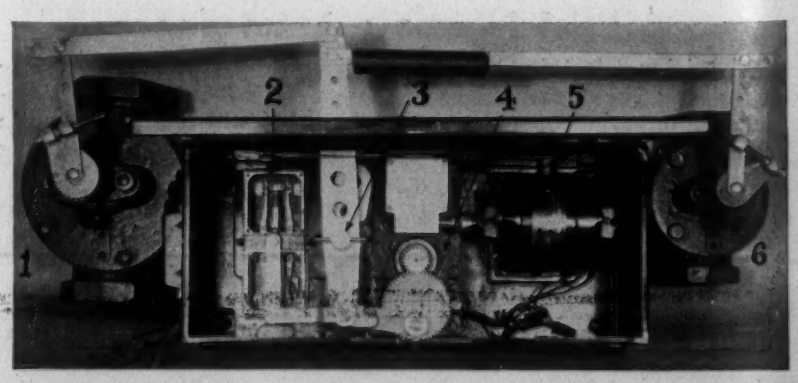
	Carbon	Manganese	Phosphorus	Sulphur
S.A.E. 1112	.08/.16	.60/.90	.09/.13	.10/.18
J. & L. Old Practice	.08/.16	.60/.90	.09/.13	.10/.18
J. & L. Improved Practice	.08/.16	.60/.90	.09/.13	.10/.18

COLD DRAWN PHYSICAL PROPERTIES

	Tensile Strength lbs./in.²	Yield Point	Elongation % in 2"	% Reduction	Brinell	Izod
Range of Test Results on Old Practice						
	70000/95000	75% T. S.	14 Min.	35 Min.	155/212	08/16
Representative Tests on Improved Practice						
¼" Rd.	94,530	90560	14.5	52.8	.....	....
½" Rd.	92,930	85340	18.5	47.7	180	9
¾" Rd.	91,700	86510	20.0	47.1	185	12
1" Rd.	86,660	80680	25.0	45.2	176	9
1¼" Rd.	85,080	81310	30.0	42.4	171	8

Multi-Position Temperature Control Device

The new multi-position temperature control device of the Automatic Temperature Control Co., Inc., Philadelphia, Pa., is to be actuated by an instrument having 5 separate contacts—2 either side of the normal setting, or the equivalent, which can be obtained through the use of available relays. Through a simple, positive limit switch arrangement, each intermediate contact between extreme low and extreme high contact in the actuating instrument has 2 definite valve positions, so that on making one of these contacts, following a drop in temperature, the valve opening (and hence the resultant fuel supply) is greater than when the same contact is made following a rise in temperature. With this control system, it is possible to assure a fuel supply more consistent with the fuel demand. Type 305 is practically independent of time lag conditions and is therefore able to make the necessary adjustments to keep a furnace within narrow limits of the control setting under changing conditions of time lag. With this unit, it is possible to get close control without "hunting," when the valves are set for a much wider operating range than is practical with other multi-position controllers. It thus fills a gap between the conventional 2- or 3-position controller and the complete balancing controller. It will function as a unit one or more valves, a damper, rheostat or other regulating equipment to one of 2, 3, 4, 5 or 6 predetermined and adjustable positions. Fuel and air valves having similar flow characteristics and individual maximum and minimum adjustments can be provided for use with Type 305 Controller. With valve openings set for desired fuel-air ratio, this ratio is maintained throughout complete travel of the valves which operate simultaneously and in unison without springs or lost motion linkage. The illustration shows a Type 305 unit with 2 valves. The units are made in 3 sizes with rated pull, at end of main operating lever, of 30 lbs., 125 lbs. and 200 lbs. respectively, the motor h.p. being 1/30, 1/15 and 1/10. A useful feature is the ability to remove the fulcrum stud, thus permitting the attendant to move the main operating lever with attached valves to any desired position. This is convenient when starting up a furnace, and makes optional the need for by-pass piping and valves for the air line.



GENERAL (0)

The Technical Man Sells His Services. EDWARD HURST. McGraw-Hill Book Company, New York, 1933. Cloth, 5½x8 inches, 239 pages. Price $2.00. An account, obviously made up out of whole cloth, of the way ten young technical graduates got jobs with firms that didn't have any jobs for them, by the process of showing the firms that they could not afford not to employ them. The account is supposed to inspire and instruct jobless graduates how to go and do likewise in their personal cases.

These ten youngsters are regular Horatio Alger heroes, marvels of tact, technical knowledge and personality, and have all become so expert in some specialized field in the last few weeks of their college course that they can go into the plant and show striking savings in a few days or weeks. One's first impression is that it would be a dangerous book to put in the hands of a youngster who had no sense of humor, for the methods suggested, applied without tact, would make an applicant quite insufferable, and they would certainly have to be modified in approaching a firm that had already used technical control and had some engineering staff. The author appears to overestimate the knowledge of the graduate fresh from technical school, and to underestimate the progressiveness of manufacturing plants in general, so the book is, in some way, strained and farcical.

A second reading alters the reader's appraisal. The book is doubtless overdrawn for a purpose; to get its message across. Perhaps because it is a bit blatant, it does leave a distinct impression. We doubt if its suggestions will prove of great use to the average 1933 graduate. We are, however, inclined to recommend it to undergraduate students, to be read at about the sophomore year, because it leads to the inescapable conclusion that the technical graduate must educate himself in the specialized field in which he is employed, without relying on his formal college courses for anything more than a broad foundation and the ability to go ahead on his own in assimilation of specialized facts.

This point of view is not necessarily produced by the college course itself nor is the will to burn the midnight oil unless an examination is in prospect. Anything that will impress on the youngster the need of digging and digging deeply into the things he needs to know for his own advancement, and that his formal education only provides him with the shovel, is worth while. This book should make that impression. H. W. Gillett (0)-**B-**

Agenda Dunod 1933, Mines. Dunod, Paris, 1933. Cloth, 4x6 inches, 335 pages. Price 20 Fr. Mining is one of the oldest industries and one can hardly expect to condense all important data pertaining to it and the related branches into 416 pages of very small size, 156 of which are devoted to laws and regulations. The infinitesimal changes made scarcely justify this, the 52nd, edition. J. D. Gat (0)-**B-**

Iron and Steel (A Pocket Encyclopedia). HUGH P. TIEMAN. McGraw-Hill Book Company, New York, 1933. Fabrikoid, 4x7 inches, 590 pages. Price $4.00. In our daily reading of the technical literature we often find it necessary to read foreign languages. This necessitates our having a foreign language dictionary at our elbow. The jargon of the mill man is also a foreign language and the first edition of this book in 1910 filled a great need. This, the third, edition has been revised to take care of improvements in processes and materials. As the dictionary is a general abridged encyclopedia for the layman, this book will be of continual use as a reference book to the man working with metals. Richard Rimbach (0)-**B-**

Thermochemistry (Thermochemie.) W. A. ROTH. Walter de Gruyter, Berlin, 1932. Cloth, 4¼x6¼ inches, 101 pages. Price 1.62 RM. It is a difficult task to try to say even the most elementary things of a field as large and important as thermochemistry in 100 pages. The author has in general succeeded in explaining the fundamentals and especially the difference between the purely chemical reactions and the thermo-chemical reactions which also include the energy transformations involved in the chemical reactions. Much space is devoted to the description of methods and instruments used for determining the heat content, heat of fusion, formation and solution, and explaining the required knowledge of the laws of thermodynamics. The mathematical deductions are naturally short, but as examples are used profusely the briefness is nowhere felt, the matter is made clear in as simple a manner as can be expected. The little volume is good to have handy in the laboratory. The printing makes easy reading. M. Hartenheim (0)-**B-**

Our Mineral Civilization. T. T. READ. Williams & Wilkins Co., Baltimore, 1932. Cloth, 5¼x7½ inches, 165 pages. Price $1.00. This one of the "Century of Progress" series of booklets on modern scientific advances, written in popular vein. This is a difficult type of writing for most scientists, but Read does it well, his colloquialisms, put in to relieve the monotony for the non-technical reader, being sufficiently apt and illuminating not to repel the scientific reader. The book shows the dependence of modern life upon the supply of minerals and upon increasing scientific knowledge of how to utilize them. Both metallic and non-metallic minerals are considered. The metallurgist will find the little book interesting as a résumé of what metals are used for what major purposes and why. He will probably not find much that he does not know, but he is very likely to find considerable that he hasn't thought out clearly. And in the process of sketching a broad picture in an attractive fashion, the author has made very few slips. On page 51, he reverses the order of cost of Ni and Cr, but to offset this, there are thousands of correct and interesting facts. It's a little book, at a small price, that will interest and instruct readers from 12 to 70. And to write a book that a school boy can read with understanding, yet one that appeals to the adult who already knows most of what the author has to say, is quite a feat. H. W. Gillett (0)-**B-**

Text-book of Physical Chemistry. (Lehrbuch der physikalischen Chemie.) Vol. 4, pages 289-624. KARL JELLINEK. Ferdinand Enke, Stuttgart, 1932. Paper, 6½x10 inches. Price 30 RM. Previous portions of this work have been reviewed. (See *Metals & Alloys*, Vol. 3, May 1932, page MA 115.) The contemplated 5 volumes have not yet been completed. This section of Volume 4 gives in considerable detail the physical chemistry of concentrated mixtures and solutions. The first 53 pages treat gaseous mixtures; the remainder is devoted to liquid mixtures. Solid solutions will be discussed in a later portion of this volume. The only portion of direct metallurgical interest deals with the heat of mixing of metals melting below 700° C (1292° F). H. W. Russell (0)-**B-**

Applied Colloid Chemistry. WILDER D. BANCROFT. 3rd edition. McGraw-Hill Book Company, New York, 1932. Cloth, 5¾x8¼ inches, 544 pages. Price $4.00. The theory of colloid chemistry, i.e., the properties of matter in finely divided form, or with at least one dimension very small, is built up deductively by stating thousands upon thousands of facts, and bringing together those that are related. Some 900 different authors are cited, many for several articles. New facts, available since the second edition was written, round out the discussions of many subjects. While the examples are taken chiefly from the field of chemistry, there is much of interest to metallurgists. Lubrication, passivity and the formation of oxide films on metals, adsorption of gas by metal surfaces, adhesion in electroplating, flotation of ores, electrostatic precipitation, slip interference, metallic luster, sintering of metals and welding of metal powder by pressure, condensation of metal vapors, and the bonding of molding sand are some of the subjects with a metallurgical bearing. Although the book is a mass of facts, it is not a jumble, since the facts are marshalled in order so that each subject is as clearly brought out as the facts, which are often scanty, will allow. The author's side comments are always enlightening and often amusing, so that the book is easy reading.

H. W. Gillett (0)-**B-**

PROPERTIES OF METALS (1)

Some Observations on the Character of Cast Iron. A. C. VIVIAN. *Foundry Trade Journal*, Vol. 47, Oct. 27, 1932, pages 250-252. An attempt to correlate mathematically the tensile and transverse strength of cast Fe. OWE (1)

1 **Mechanical Properties of Nickel Wires.** C. E. RANSLEY & C. J. SMITHELLS. *Metal Industry*, London, Vol. 41, Dec. 2, 1932, pages 541-543; Dec. 23, 1932, pages 611-612. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 2. Ha (1)

Change of Thermo-electric Force in the Recuperation of Metals from Cold-Working. (Die Aenderung der Thermokraft bei der Erholung der Metalle von der Kaltbearbeitung.) G. TAMMANN & G. BANDEL. *Annalen der Physik*, Series 5, Vol. 16, Jan. 1933, pages 120-128. Thermo forces of Ag, Cu, Au, Fe, Ni, Pt for hard and soft wires of the same material in contact were measured for different degrees of cold-working. Results are given in curves. Ha (1)

2 **Decay of Torsional Oscillation of an Iron Wire Effect of Variation of Period.** F. W. ALEXANDER. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 13, May 1932, pages 934-938. Investigation undertaken to determine variation of constant n, in formula for torsional oscillation in wires $y^n(x+a)=b$, when period of oscillation i.e. moment of inertia of system, was varied, length, load, and torsion applied being constant. Apparatus used is described in detail and 2 tables present results. No law between period of oscillation or moment of inertia and n is apparent. Further experiments in which precautions were taken to keep physical state of wire as nearly same as possible showed no variation, aside from experimental error, in value of n. Period of oscillation is altered by change of moment of inertia, period being varied between 7.9 sec. and 14.63 sec. RHP (1)

3 **The Cry of Tin.** E. N. DA C. ANDRADE & BRUCE CHALMERS. *Nature*, Vol. 129, Apr. 30, 1932, pages 650-651; June 4, 1932, page 833. The "cry" of Sn is not peculiar to that metal, but has been obtained also from single-crystal specimens of Cd and Zn. It appears to be an accompaniment of twinning in both polycrystalline and single crystalline states. A "cry" has not been obtained from metals crystallizing in cubic system. The sound probably indicates that twinning is propagated from layer to layer with a velocity of the order of that of sound. Possibly phenomenon exists in other cases, but frequency may be too high for audibility. Ha (1)

Constitution of Tantalum and Niobium. F. W. ASTON. *Nature*, Vol. 130, July 23, 1932, page 130. Since the atomic weights of Ta and Nb given by chemical methods have been regarded as unsatisfactory, investigations were carried out by mass-spectrum analysis. Experiments and results are discussed and the new atomic weight of Ta is given as 180.89 ± 0.07 and that of Nb 92.90 ± 0.05. Kz (1)

A Revision of the Atomic Weight of Thallium. The Analysis of Thallous Chloride. GREGORY PAUL BAXTER & JOSEPH SMITH THOMAS. *Journal American Chemical Society*, Vol. 55, June 1933, pages 2384-2387. Atomic weight of Tl found in this work, 204.40, confirms very closely work of other investigators. MEH (1)

5 **The unusual metal or alloy of today may be the usual metal of tomorrow.**

You will profit by looking over this section as well as the sections on non-ferrous and ferrous alloys.

6 **A Revision of the Atomic Weight of Arsenic. I. The Analysis of Arsenic Tribromide. II. The Analysis of Arsenic Trichloride.** GREGORY P. BAXTER, WILLIAM E. SHAEFER, MERRILL J. DORCAS & EDWARD W. SCRIPTURE, JR. *Journal American Chemical Society*, Vol. 55, Mar. 1933, pages 1054-1066. By analysis of the trihalides of As the atomic weight of As is found to be 74.91. MEH (1)

A Revision of the Atomic Weight of Arsenic. The Comparison of Arsenic Trichloride with Iodine Pentoxide. GREGORY P. BAXTER & WILLIAM ERNEST SHAEFER. *Journal American Chemical Society*, Vol. 55, May 1933, pages 1957-1963. This work gives evidence that the atomic weight of As is not far from 74.91. MEH (1)

7 **Second Report of the Committee on Atomic Weights of the International Union of Chemistry.** G. P. BAXTER, MME. M. CURIE, O. HÖNIGSCHMID, P. LE BEAU & R. J. MEYER. *Journal American Chemical Society*, Vol. 54, Apr. 1932, pages 1269-1279. This report covers all atomic weight investigations published in the period Feb.-Oct., 1931, which have come to the attention of the Committee. Future reports will cover a 12-month period. The following changes are recommended: Kr 83.7 instead of 82.9, and Xe 131.3 instead of 130.2. MEH (1)

Iron and Its Compounds. (Eisen und seine Verbindungen.) (Handbuch der anorganischen Chemie.) Vol. IV, 3rd part, 2nd section, subdivision A2. Edited by R. ABEGG, F. AUERBACH & E. KOPPEL. S. Hirzel Verlag, Leipzig, 1933. Paper, 6½x9½ inches, pages A 337-A 558. Price 21 RM. Abegg's comprehensive handbook of inorganic chemistry has a volume (IV) on the elements of the 8th group of the periodic system, which is appearing in several parts. Those on iron and its compounds so far published were A1 on Iron, the atom and the metal, which appeared in 1932, and B1 and B2, respectively on Compounds of iron, 1930, and Complex cyanides of iron, 1932. The present volume is A2, dealing with the metal, as to passivity and corrosion, with equilibria in the systems Fe-O, Fe-C-H, Fe-H-O, and Fe-C-O, and with technical processes of the ferrous industries involving these equilibria.

The individual authors of these sections are G. Veszi, G. Schikorr, K. Hofmann and I. Koppel. There are about 480 literature references on passivity, 880 on corrosion, and 300 on the equilibria listed.

The treatment is that of the physical chemist. As much information as possible is given in diagrams, which often include more or less conflicting data from several observers. The scope of the work is so great that no great detail can be given on any one point and it is necessary to take up a great deal of space in merely listing authors' names and giving numbered references to the bibliography.

On account of the rather abstract way in which the comments are presented, it is almost essential that the reader be quite conversant with physical chemistry to grasp a good deal of the information presented.

The last section, dealing with blast furnace practice, carburizing, malleablizing, etc., is somewhat easier reading for the average metallurgist.

Although there is no alphabetical index, the material is well sub-divided into headings and from the table of contents a given subject can be fairly readily located. The volume will appeal to the average metallurgist more from the bibliographical standpoint, as a guide to more specific literature, than as a reference book for its own contents. Yet there is much useful information in it, especially in the many diagrams. H. W. Gillett (1)-**B-**

PROPERTIES OF NON-FERROUS ALLOYS (2)

Rational Use of Aluminum Bronze Through Study of Solidification, Forging and Internal Strains. (Utilisation Rationelle du Bronze d'Aluminum par l'Etude de la Solidification, Corroyage et Tensions Internes.) C. H. MEIGH. *Bulletin de l'Association Technique de Fonderie,* Vol. 16, Aug. 1932, pages 427-431; *Foundry Trade Journal,* Vol. 47, Oct. 20, 1932, pages 234-235. Paper at World Foundry Congress, Paris, Sept. 1932. A study of design and casting process enables one to produce sound castings of Al bronze. In most cases, cast bronze is cheaper and sounder than forgings. Internal strains, which do not deform a casting when a great portion of its thickness is removed by machining, should be considered as negligible. OWE + WHS (2)

Beryllium Adds Strength to Copper. J. KENT SMITH. *Iron Age,* Vol. 129, Mar. 31, 1932, pages 767. Abstract of paper read before the Institute of Metals Division of the A. I. M. M. E., New York. See "Copperberyllium 'Bronzes'," *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 235. VSP (2)

Special Alloys. (Spezial-Legierungen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Jan. 8, 1933, page 16; Jan. 22, 1933, page 36; Apr. 2, 1933, page 142; Apr. 30, 1933, page 184. These installments continue review on composition, properties and application of special alloys, and deal with Christofle metal, Chromax bronze (a Ni-brass alloy) Chromel (electric resistance alloys of variable composition), Cazin (Cd and Zn bearing special solder) Chronin (electric resistance alloy with 83.7% Ni and 14.7% Cr) Chrysiode (92% Ag, 8% Al), Carbondale silver (German silver with relatively high Cu content) Carmelia bronze, a Pb and Zn rich bronze recommended for machinery bearings, Chrysorin, Chrysochalk, Cindal metal, Clarks patent alloy, Coe bronze, Cochrom. (Co- Cr- Fe alloy.) GN (2)

High Duty Brass and Bronze Castings. J. ARNOTT. *Metallurgia,* Vol. 7, Apr. 1933, pages 185-186. High strength castings can be made from an alloy of 58% Cu, 37% Zn, 1.5% Fe, 1.5% Al and 2.0% Mn. Other high-strength alloys including those containing Ni are described. Alloys suitable for definite uses are also discussed. JLG (2)

Copper-Nickels with Silicon. (Les Cupro-Nickels au Silicium.) MARCEL BALLAY & AUGUST LETHOMAS. *Bulletin de l'Association Technique de Fonderie,* Vol. 16, Sept. 1932, pages 598-611. Paper at World Foundry Congress, Paris, Sept. 1932. A steam valve alloy, Ni 50%, Cu 34%, Sn 16%, is studied. Use of Si in this alloy increases hardness, 3% of Si will replace 8% Sn. Si, replacing Sn in bronzes, increases hardness at high temperatures. The presence of a little Ni increases hardness. WHS (2)

Magnetic Susceptibility and Electric Resistance of the Series of Solid Solutions Pd-Ag and Pd-Cu. (Magnetische Suszeptibilität und elektrischer Widerstand der Mischkristallreihen Pd-Ag und Pd-Cu.) B. SVENSSON. *Annalen der Physik,* Series 5, Vol. 14, Sept. 1932, pages 699-711. The measuring method is described and results given in curves and tables. Ha (2)

Mechanical and Chemical Properties of Alloys of Aluminum with Cr, Fe, Mg, Mn, Ti, and V. (Über die mechanischen und chemischen Eigenschaften von Legierungen des Aluminiums mit Cr, Fe, Mg, Mn, Ti, V.) H. BOHNER. *Metallwirtschaft,* Vol. 12, May 5, 1933, pages 251-255; May 12, pages 265-267. Mechanical properties of Al wire, alloyed with various amounts of Cr, Mn, Ti, and V, hard drawn and annealed at various temperatures, were determined. Retardation of primary recrystallization and crystal recovery due to alloy additions was determined. Optimum percentage of alloys was found to be 1 to 1.5% of Cr and Mn, and about .5% of Ti and V. Alloys of 99.5% Al and Al containing about 1% Fe with optimum percentages of Cr, Mn, Ti and V, in strip form, which had been annealed between passes at various temperatures, and either unannealed or annealed at various temperatures after rolling were tested for tensile strength, elongation, Erichsen ductility and corrosion resistance. To these alloys 1% Mg and .10-.15% Ti was also added. Small Ti additions produce considerable grain refinement and increased corrosion resistance. The annealed Al-Mn-Ti alloy with an Erichsen ductility equivalent to annealed pure Al has greater chemical resistance than pure Al and Al-Mn alloy in the hard or annealed condition, and has much better strength than pure Al. The addition of 1% Mg to this alloy increases the strength 50-100%, with only slight lowering of the chemical resistance, it still being higher than that of pure Al. The best corrosion resistance was obtained in the Al-Mg-Cr-Ti alloy. With the same thermal and mechanical treatment it has 100% higher strength than pure Al and several times better corrosion resistance. The corrosion resistance of this alloy is relatively independent of annealing temperatures and hardness, contrary to pure Al. The crystal recovery and recrystallization of these two alloys is considerably retarded compared to pure Al and Silumin, which is of practical importance. A large amount of data on the various alloys is given in graphic and tabular form. 18 references. CEM (2)

Thermal Expansion of Manganin (Ueber die thermische Ausdehnung des Manganins). ALFRED SCHULZE. *Zeitschrift für technische Physik,* Vol. 14, No. 2, 1933, page 89. Thermal expansion of manganin was determined between room temperature and 500° C. The material is an alloy of 86 parts Cu, 12 parts Mn and 2 parts Ni. Ha (2)

Lead Bronzes. (Les Bronzes au Plomb.) LEON GUILLET. *Cuivre et Laiton,* Vol. 5, Sept. 30, 1932, pages 425-426. Addition of Pb to Cu-Sn alloys improves their machinability but reduces their mechanical properties; up to 2.5% Pb action is, however, not very great, at least for castings. Bronzes with much Pb have certain importance as bearing materials, modern alloy is Cu 63, Sn 6, Pb 30, Ni 1; it forms a solid solution which is not very hard, and free Pb. It must be cast at a higher temperature than ordinary bronze and cooled as fast as possible. 2 other types often used now are:

Cu	Sn	Zn	Pb	Tensile Strength kg./cm.^{2}	Yield point	Elongation %
88	6	4	2	30	15	40
92	6	trace	2	40	20	30

Ha (2)

The Role of the Platinum Metals in Dental Alloys, III.—The Influence of Platinum and Palladium and Heat Treatment upon the Microstructure and Constitution of Basic Alloys. E. M. WISE & J. T. EASH. *American Institute Mining & Metallurgical Engineers, Contribution* No. 12, Feb. 1933, 28 pages. The effects of replacing part of the Au in Au-Cu-Ag alloys was determined. All alloys contained 20 atomic % Ag, 29 atomic % Cu and 1 atomic % Zn. As much as 30 atomic % Pd or 20 atomic % Pt was added. Both Pd and Pt raised the liquidus and solidus, but the solidus did not increase above 14 atomic % Pt as a peritectic reaction occurred. Pd and even more effectively Pt, decreases grain growth. Actually heating the Pd or Pt rich alloys to slightly above the solidus does little damage to their mechanical properties. The excess phase present in a high-Pt alloy was segregated and found to contain Pt, Au and Cu. It is evidently derived from the compound AuCu. Variation of the solubility of the Pt-content phase in the α solution was determined. Its change in solubility is responsible for the marked age hardening. Hardening by heat treatment also results from other structural changes. The alloys were studied by microscopic, dilatometric and X-ray methods. The various crystallographic changes occurring in the alloys are described, but cannot be reviewed in this abstract. An appendix describes polishing and etching technique. 7 references. JLG (2)

PROPERTIES OF FERROUS ALLOYS (3)

Austenitic Cast Iron. (Austenitisches Gusseisen.) R. MÜLLER & R. HANEL. *Die Chemische Fabrik,* Vol. 5, Dec. 21, 1933, pages 493-497; Dec. 28, pages 504-505. Austenitic cast iron, also called "Ni-Resist," usually contains 12-15% Ni, 5-7% Cu, 1.5-4% Cr, 1-1.5% Mn, 2.75-3.10% total C, and 1.25-2.00% Si. The resistance to growth and scaling due to heat can be greatly increased by raising the Cr content as high as 20%. The machineability with 2% Cr is about the same as ordinary cast iron, but as the Cr is raised it becomes harder to machine. With 4% Cr the physical properties are tensile strength 14-24 kg./mm.^{2}, elongation 1-2.5%, transverse strength 27-52 kg./mm.^{2}, Brinell hardness 200, Izod impact 11-15.2 mkg., shrinkage 1.33%, Sp. Gr. 7.686, electrical resistance .95 ohm-mm.^{2}/m. The corrosion resistance compared with cast iron and brass against many chemicals is given in tables. In some cases it is as high as 400 times better than cast iron. The composition of austenitic iron can be varied according to its intended use. It has good resistance to wear and erosion. It has no tendency to grow on repeated heating and cooling. It retains its strength at elevated temperatures better than cast iron. With 2% Cr it is non-magnetic. Its coefficient of expansion is greater than cast iron, 18 to 20x10^{-6}/°C. at 315°C. For this reason it is used for cylinders or cylinder liners in connection with aluminum alloy pistons in Diesel and aircraft engines. To improve the machineability it can be heated to 950°-1000°C. and quenched in water. It can be welded, using Monel metal for welding rod. Other applications are for parts operating at high temperatures or under corrosive conditions. It can be melted in a cupola, crucible or electric furnace, from cast iron with the addition of about 25% Monel metal and ferro-chrome. The molding sand should be the same as for cast iron. Casting temperature 1350°-1400°C. 16 references. CEM (3)

Special Steels. T. H. BURNHAM. 2nd Edition. Isaac Pitman & Sons, London, 1933. Cloth, 5½x8½ inches, 234 pages. Price 12s 6d. This is, says the author, "chiefly founded on the researches regarding alloy steels of Sir Robert Hadfield," and contains a foreword by him.

The information contained has all been published elsewhere, and the volume serves merely as a very sketchy summary. The Hadfield note is overdone, statements as to the properties of steels such as "Hecla," "Galahad," "Era," etc., made by Hadfield's, Ltd., being given without adequate description of the composition or treatment of the steel. Thus, in some ways the book gives the impression of being but slightly removed from an advertising pamphlet.

Some revision, and a new chapter on "recent development," are supposed to bring the present edition up to date. These changes are rather slight and the newer developments are dealt with only by way of generalities, without references to recent literature that describes them in detail. There is a list of a couple of hundred papers by Hadfield and a list of standard books, but modern periodical literature is disregarded, so the reader is not guided to sources of further information on the new subjects so briefly discussed. The revision is disappointing. In the older section of the book, copper steels are mentioned. In the added chapter, precipitation hardening is mentioned, but the reader is not informed that steels of suitable copper content are precipitation-hardenable.

Since several other better books are available on the subject, the metallurgist would seldom open this book if he had it on his shelves. H. W. Gillett (3)-B-

Modern High-Speed Steels and Their Characteristics. J. P. GILL. *Machinery,* Vol. 38, May 1932, pages 662-664. There are 3 types of high-speed steel in common use. (1) 18% W, 4% Cr, 1% V; (2) 14% W, 4% Cr, 2% V; (3) 18-4-1% type plus a variable percent Co. Type (3) is the most generally used. C content usually ranges from 0.67 to 0.72%, Si usually under 0.35%, Mn under 0.35%, S and P under 0.03%, Co 4-12%, Mo under 2.50%. V increases cutting efficiency but is limited due to high cost. W must be balanced between cutting ability and toughness. Deals briefly with applications and physical characteristics of high speed steels. RHP (3)

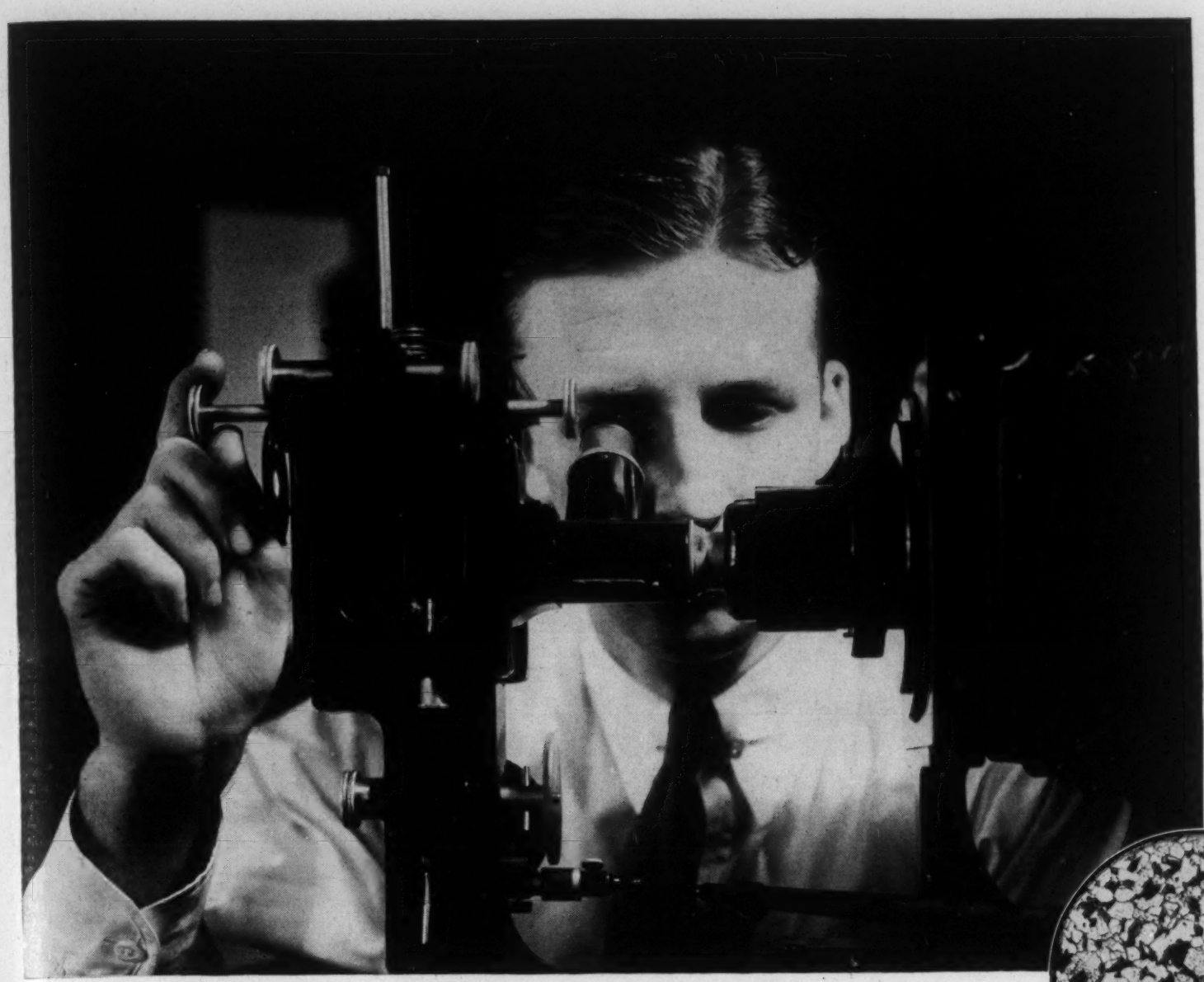
Alloys of Palladium with Iron. (Ueber Legierungen des Palladiums mit Eisen.) A. T. GRIGORJEW. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Dec. 1932, pages 295-307. Fusibility, hardness, microstructure and temperature coefficient of electric conductivity were investigated for the continuous series from 0-100% Pd. The melting curve shows the existence of solid solutions and 2 groups of inflection points. The melting diagram shows a minimum at 50% Pd. The compound Pd_3Fe exists and is formed with a considerable liberation of heat. Curves, micrographs and test methods are given in detail. 14 references. Ha (3)

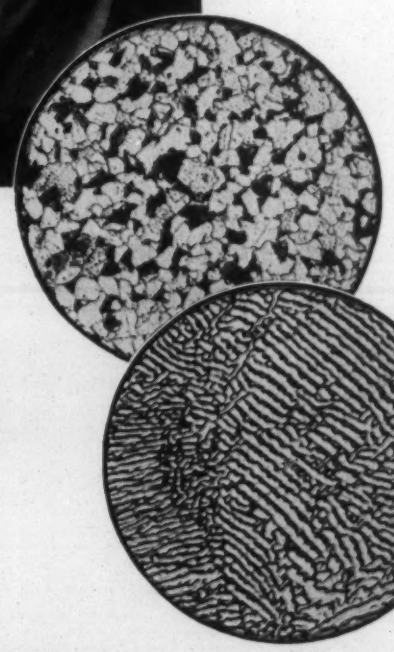
Some Observations on Static Bending Tests of Cast Iron. (Quelques Observations sur les Essais de Flexion Statique des Fontes.) GUILLEMEAU. *Bulletin de l'Association Technique de Fonderie,* Vol. 16, Sept. 1932, pages 512-519. Paper at World Foundry Congress, Paris, Sept. 1932. Specifications calling for certain deflections at breaking load are not satisfactory. Ultimate deflection does not show a definite relation to breaking load. Deformation between 100 and 400 kg. loads does show a relation to breaking load on Fremont specimens and classifies samples according to their order of elastic moduli. 11 references. WHS (3)

Chromium-Molybdenum Steel in Construction of Automobiles. (Chrom-molybdän Stahl im Automobilbau.) H. FRANZ. *Automobiltechnische Zeitschrift,* Vol. 35, Sept. 25, 1932, pages 440-442. Differences in use of refined Cr steels in America and case-hardened Cr-Ni steels in Europe are discussed. Lately Cr-Mo steels have found wide use as their machinability, formability in pressing, endurance strength and wearing resistance are superior to the 2 other kinds of steel. Physical properties are given. Cr-Mo steels with about 0.23 to 0.35 Mo are particularly suitable for crankshafts and gears; for latter a steel with more than 0.45 C and 0.25 Mo should be used. These gears have been tested with speeds of 6 m./sec. at 300 kg./cm.^{2} pressure and stood up very well. Also for front and rear axles Cr-Mo steel has proved its value in place of the more expensive Cr-Ni steel. Ha (3)

The Open-Hearth Process for Steel Castings Production. W. H. THOMPSON. *Foundry Trade Journal,* Vol. 48, May 18, 1933, pages 351-352. Casting properties of acid, basic, and neutral steels are summarized. Author finds from experience that neutral steel has several advantages over acid or basic steel for large castings. A table shows compositions of slags used, and convenient casting temperatures and heat treatments are given. OWE (3)

The New Cast Irons and Their Heat Treatment. J. W. URQUHART. *Mechanical World & Engineering Record,* Vol. 43, Jan. 1933, pages 25-27. Reviewing development of cast iron, author mentions difficulties overcome by recent research, aiming at a high degree of heat resistance and an increase in static strength of new castings with a high degree of fluidity. Influence of Ni and Cr additions in usual proportion of 0.25% Cr to 0.85% Ni is discussed. Shock resistance of alloy castings is of a high order even without heat-treatment. Apart from casting-strain relief increased toughness with refinement of grain is to be expected by heat-treatment at 980°C. for 2 hours per inch of cross-section of heaviest parts. A second treatment at 760°C. improves machinability further. Advantages of increased fluidity in castings and diminution of porosity in castings are dealt with. Cr additions are intended to increase wearing qualities, heat resistance and corrosion resistance depending on percentage of Cr. High Ni contents increase machinability and density. Hard martensitic castings carry from 5-7% Ni, with as much as 1% Cr. Castings subjected to caustic corrosion carry from 1-3% Ni with reduced Si content. When adding Cr to cupola charge there is usually a loss of 10-15% due to oxidation, while no loss of Ni occurs. When ladle additions are made, the nature of these materials is of considerable importance. Kz (3)





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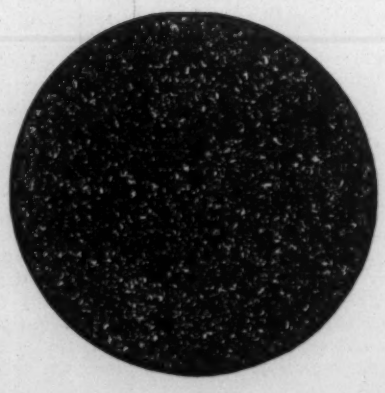

BETHLEHEM STEEL

BETHLEHEM *Fine* ALLOY STEELS

No More Valve Grinding! JOSEPH GESCHELIN. *Automotive Industries*, Vol. 68, Feb. 18, 1933, pages 188-192. In reviewing recent innovations and developments, writer finds that aim of valve seat insert improvement is elimination of valve grinding. This common service job would be completely dispensed with by use of new material and its method of application. Three major requirements of a valve seat material are: 1. it must have approximately same coefficient of expansion as cylinder block material; 2. it must resist abrasion and softening at elevated temperatures; 3. it must resist formation of deposits of foreign substances. Table below gives a summary of different materials used and method of application in production work.

Name	Material	Method or Application	Press Fit
Buda	Spec. Alloy Iron	Pressed and rolled in	0.006-0.007 in.
Haynes-Stellite	Bi-metal	Screwed-in	
White Motors	Bi-metal	Screwed-in	
Hercules	Cast Fe	Pressed and rolled-in	
Waukesha	Special Alloy Fe	Pressed	0.008-0.010 in.
Lycoming	High Tungsten Steel	Pressed and rolled-in	
Allis Chalmers	High Speed Tool Steel	Pressed	0.003-0.007 in.
Autocar	High Speed Tool Steel	Pressed and rolled-in	0.007 in.
Sheepbridge-Stokers	Centrifugal Cast Fe	Spec. press fit	1½ ton pressure

DTR (3)

Cast Iron and the Maurer Diagram. (La Fonte et le Diagramme de Maurer). G. D'ARDIGNY. *Revue de Fonderie Moderne*, Vol. 26, Dec. 5, 1932, pages 471-473. Relation between C and Si in a cast Fe and its representation in the Maurer diagram is explained and application of diagram for determining required percentage for a given wall thickness is described. Ha (3)

The Strength of Cast Iron in Relation to Combined Carbon Content. J. G. PEARCE. *Bulletin British Cast Iron Research Association*, Vol. 3, Oct. 1932, pages 147-149. Fact that thin sections of a casting are usually stronger and harder than thicker sections of same casting, and that castings of higher combined C content are stronger and harder than those of lower C content was investigated for its true reason. It was found that it cannot be ascribed to a change in combined C from edge to center as this showed to be the same in very narrow limits but that it is partly due to graphite which while not increasing in quantity towards the center, increases in size; the flakes are fewer but longer. Change in hardness might to some extent depend on combined C content or on change in structure. Testing methods of the mechanical strength of cast Fe should therefore not be based on combined C content. Test results are shown in diagrams. Ha (3)

Economy Dictates Better Iron for Gear Castings. F. L. MOREHEAD. *Modern Machine Shop*, Vol. 5, Feb. 1933, pages 7-12. Some examples of gears are described where small percentages of Ni with or without Cr added to cast iron improved strength, wear resistance porosity in heavy sections, and eliminated hard spots. Several mixtures of steel, scrap and pig iron are given, the Ni content is usually about 1.5%, with 0.8-1.0% Mn. Ha (3)

Development of New Types of Steel for Special Purposes. (Die Ausbildung neuerer Stahlsorten für Sonderzwecke.) E. H. SCHULZ. *Der Ingenieur*, Vol. 46, Sec. B, Dec. 19, 1931, pages 329-339. Development of Cr-Ni steels, W steels and others, as heat-, acid-, and corrosion-resistant materials is reviewed and their characteristic behavior and physical and chemical changes under such attacks described. Physical properties of several steels for structural purposes, shipbuilding and army and navy purposes are tabulated and influence of O on mechanical properties briefly explained. Ha (3)

Cast Iron for Thin Wall Castings. (Das Gusseisen für dünnwandige Teile.) L. SCHMID. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Mar. 19, 1933, pages 110-112. Discusses requirements which such cast Fe must meet, chemical composition, composition of charge; suitable chemical composition and charges for various thin-walled articles are tabulated. Mechanical properties are briefly dealt with. GN (3)

White Iron. J. H. LIST. *Mechanical World & Engineering Record*, Vol. 91, Mar. 4, 1932, page 219. A metal which has a white fracture, is particularly close-grained, very brittle, hard, and quite unmachinable. It consists of 100% mild-steel scrap and borings melted in a cupola. In castings holes must be cored, and where parts have to be machined soft Fe cores or bushings must be cast in. Results of tests are:

Material	Tensile Strength tons/in.²	Transverse Breaking Loads, Cwts.	Compression tons/in.²
White iron	10.5	31.4	175.0
Gray iron	15.0	26.0	67.0
Semi-steel	18.0	35.3	88.0

The metal is suitable for linings to haulage wheels, brake-blocks, rings for brick and stone crushing rollers, etc., where high strength under compression is required. Kz (3)

Effect of Successive Elongations Followed by Aging on the Elastic Limit and on Young's Modulus of a Soft Steel. (Influence de la valeur de l'allongement realise au cours de tractions successives, suivies de viellissements, sur la limite elastique et le module d'Young d'un acier doux.) J. GALIBOURG. *Comptes Rendus*, Vol. 195, Nov. 28, 1932, pages 1022-1024. It is found that under influence of successive extensions highest value of final elastic limit is obtained for smallest percentage elongations and largest number of extensions, but then total elongation before breaking is a minimum. After first extension elastic limit after aging is less, the smaller the load employed. Curves for loading and unloading are exactly superposed, showing that after particular treatment employed elasticity of metal is re-established. Young's modulus of original metal is greater than that of treated and aged metal if loads are referred to initial cross-section before first extension, but is less if loads are referred to section after last extension. OWE (3)

Mechanical Properties of Alloyed Cast Iron and a New Method for the Evaluation of Bending Tests. (Ueber die mechanischen Eigenschaften legierten Gusseisens und ein neues Verfahren zur Auswertung von Biegeversuchen.) H. JUNGBLUTH & A. POMP. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 15, No. 7, 1933, pages 71-80. The influence of Ni and Cr as alloying constituents in cast iron was systematically studied on a series of synthetically composed castings with 0-2% Ni and 0-0.3% Cr. It can be stated that bending strength and deflection do not very satisfactorily reflect the influence of Ni and Cr on the mechanical properties but that the bending number clearly shows the fact that with increasing Ni content the material becomes more rigid. A mathematical expression gives the relation between bending stress and deflection. Material made in the cupola furnace in general shows a smaller elongation with decreasing C and Ni content; Ni produces an influence only at 2% content in material with high C and without Cr; if Cr is present, the Ni influence begins to show at 1% Ni. Tensile strength increases generally with Ni and Cr but not appreciably more than in not alloyed cast iron. With regard to Brinell hardness it was found that with 2% Ni not much difference exists for high and low C content while between 0 and 1% Ni considerable differences existed. Structural examinations confirmed the statements of the mechanical tests. 10 references. Ha (3)

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION (4)

Protection of Steel Tubes Against Stray Currents. (Schutz der Stahlrohre gegen vagabundierende Ströme.) FR. BESIG. *Gas und Wasserfach*, Vol. 76, Feb. 25, 1933, pages 129-130. Discusses various methods of protection of welded steel pipe lines against stray currents by improved surface insulation or other means, as the use of special insulated parts. GN (4)

Corrosion of Tin Plate Used in the Manufacture of Containers for Canned Foods. (Sur la Corrosion de Fers-Blancs utilises dans la Fabrication des Boites de Conserves.) G. GIRE. *Annales des Falsifications et des Fraudes*, Vol. 24, July 1931, pages 355-363. Experiments are described on rate of corrosion of Sn plate in dilute solutions (0.01-0.1 N) of acetic, oxalic, tartaric, citric, malic and lactic acids under conditions approximating those to which containers for canned foods are subjected. Although experiments only constitute preliminaries of a more extensive investigation, they showed clearly that acetic acid very readily exerts a local corrosive action, which is attributed to intensive electrolytic action at points where acid has bared the Fe, and that other acids readily dissolve Sn. Ha (4)

Corrosion of Magnesium. *Mechanical World & Engineering Record*, Vol. 43, Feb. 3, 1933, page 100. Al being unattacked by most acids is attacked by alkalies, whereas Mg is attacked by most acids but unaffected by alkalies. Since ordinary air contains traces of acids Mg alloys are the more corrodable ones. Effort to overcome this deficiency has been without complete success so far. The best alloying results have been secured by the addition of Mn which forms a good corrosion-resistant alloy with Al. No success has been secured in coating Mg with other metals by various methods. Protection of alloys by a coating of pure metal, successfully applied to certain Al alloys, has met with no success in case of Mg alloys. A successful anodic process for Mg has not been developed. The best way of protection has so far been obtained with a simple immersion process, using as bath an aqueous solution of potassium dichromate, potash alum, and caustic soda. The film formed can be improved by coating with lanolin, likewise the anodic film on Al. Kz (4)

Effect of Pressure on the Attack of Hydrogen Sulphide on Steels. (Über den Einfluss des Druckes beim Angriff von Schwefelwasserstoff auf Stähle.) EGBERT DITTRICH. *Die Chemische Fabrik*, Vol. 6, Jan. 11, 1933, pages 25-30. Samples of 26 different ordinary and stainless steels and alloys were tested by heating in a tube furnace for 20 hours in an atmosphere of H_2 and up to 16% H_2S at temperatures up to 500° C. The pressure was varied from 1 to 75 atmospheres and the gain in weight per unit of surface was determined. The attack increases logarithmically with temperature increase. It is usually greater under pressure than at normal pressure. The attack is not directly proportional to time, the rate gradually decreases. None of the steels had 100% resistance to the attack. With the steels containing more than 13% Cr the attack did not change much with varying pressure and H_2S concentration. With less than 13% Cr the corrosion increased with increasing pressure and H_2S content. Steels with less than 6% Cr are attacked more at certain temperatures under high pressure than plain carbon steels which corrode much more at atmospheric pressure. All steels are attacked more at high than at ordinary temperatures. The higher the Cr content the higher the temperature at which the corrosive attack begins. Additions of Ni lower this temperature, Mo raises it. With increasing temperature the difference between the unalloyed and alloy steels becomes less. Under some conditions it is not worth while to use an expensive alloy steel. Steels containing Si and Al and nitrided steels were not satisfactory. 8 references. CEM (4)

Effect of Heat-Treatment of the Metal on the Determination of Silicon in Aluminum and the Loss of Volatile Silicon Compounds in the Mixed Acid Method of Solution of Metal. L. H. CALLENDAR. *Analyst*, Vol. 57, Feb. 1933, pages 81-88. Six samples of Al of varying Si content annealed at 550° C. for 24 hrs. and quenched were split and analyzed for Si by 4 methods: (1) Metal dissolved in a mixture of H_2SO_4, HNO_3, and HCl; (2) metal dissolved in H_2SO_4; (3) metal dissolved in 10% NaOH solution in a Ni crucible, boiled to convert Si to SiO_2, then poured into excess H_2SO_4; (4) metal dissolved in HNO_3 + 60% H_2SO_4. There was as much as 20% difference by the methods. Methods 3 and 4 agree well and 1 and 2 give fair agreement, but about 20% lower than 3 and 4. There was less loss of Si in Method 1 if the samples were annealed at 300° instead of 550°. Volatile Si compounds given off in acid attack can be absorbed by Br-soda. The degree of absorption is influenced by the rate at which the gases pass through the absorbents. Only in soda method of attack are no volatile Si compounds formed. AHE (4)

Study of Corrosion of Metals by Light-Scattering. (Étude du mode de corrosion et de la susceptibilité corrosive des métaux par la diffusion de la lumière.) FRANCOIS CANAC. *Comptes Rendus*, Vol. 196, Jan. 3, 1933, pages 51-53. Corroded metal surface is illuminated by a parallel beam of light at a fixed angle of incidence (30°), and intensity of light scattered at a definite angle (15°) is measured by a photometer. 2 graphs show the 2 types of curves found to connect intensity of scattered light with the time during which the metal is exposed to corrosive liquid. One type of curve is of an exponential nature throughout, while the other commences as a parabola before tending to a limit. A simple theory of corrosion enables general shape of the curves to be accounted for. Method has advantages over the usual methods for studying corrosion. OWE (4)

Rapid Detection of Rates of Corrosion with Simplified Apparatus. CLOYD M. CHAPMAN. *Water Works & Sewerage*, Vol. 74, Aug. 1932, pages 282-284. Corrosion tester consists of a heat treated Al yoke with a stuffing box and means for projecting a stainless steel spindle through a valve into atmosphere or liquid the corrosive influence of which is to be tested. The highly polished sample is fastened to the spindle and exposed a certain length of time, a few hours to a few days. A subsequent examination with a microscope of about 50 magnifications shows clearly degree of corrosion. Several examples of different metals are illustrated. Ha (4)

Prevention of Silica Scale with Sodium Aluminate. C. H. CHRISTMAN, J. A. HOLMES & H. THOMPSON. *Industrial & Engineering Chemistry*, Vol. 23, June 1931, pages 637-646. Silicate scale in boilers has caused loss from blistered tubes as well as heat losses from reduced heat transfer. Silica reduction in external softening may be improved by using Na aluminate as the coagulant. MEH (4)

Effect of Temperature on the Corrosion of Zinc. G. L. COX. *Industrial & Engineering Chemistry*, Vol. 23, Aug. 1931, pages 902-904. Corrosion of Zn in distilled water continually saturated with air is affected tremendously by temperature. Most important factor influencing these rates at different temperatures is shown to be physical nature of corrosion-products film. Experimental results are satisfactorily explained by a consideration of physical properties of film, rate of transfer of dissolved oxygen, and oxygen concentration of corroding media. MEH (4)

The Initial Corrosion Rates of Metals. R. H. BROWN, B. E. ROETHELI & H. O. FORREST. *Industrial & Engineering Chemistry*, Vol. 23, Apr. 1931, pages 350-352. Initial corrosion rates of Al, Fe, Zn, Cu, Ni, Sn, and Ag in oxygenated water have been studied. Electrochemical series in ordinary sense was found to be inadequate in predicting corrosion tendencies of metals in oxygenated water. Calculations based on free-energy changes show that all metals studied tend to corrode in saturated solutions of their hydroxides containing oxygen. These metals were found to corrode at appreciable rates during the initial period, and to decrease or become zero after the initial period, indicating formation of films which reduce rate of diffusion of ions and dissolved oxygen. MEH (4)

Does the Krupp Test Forecast the Life of 18-8? V. B. Browne. *Metal Progress,* Vol. 24, July 1933, pages 35-40, 60, 62. Accuracy of some old corrosion tests are discussed. Mechanism, theory and prevention of intercrystalline corrosion are described. Cb is believed the only element which may be added to prevent intercrystalline corrosion without affecting the inherent corrosion resistance of metal. Krupp test consists in boiling an alloy, previously heated for various periods in the dissociation range, in a solution containing 10% H_2SO_4 and 10% $CuSO_4$. In this test, 18-8 will completely disintegrate, or lose its metallic ring, or be unaffected, depending on composition and time at heat. Author does not believe this specialized test is representative of resistance because specimens passing this test will corrode in other solutions such as boiling HNO_3. 3 plates of 18-8 corrodible around the weld in HNO_3, but which stood the Krupp test indefinitely are shown. If a high C, (0.12%), 18-8 alloy is heated to 1200° F. for a few hours and subjected to the Krupp test it will rapidly disintegrate. Heated to 1550° for a short time it is unaffected in that test. The microscope will show, however, that the alloy heated to 1550° contains much more precipitated carbide than the alloy heated to 1200°. Prolonged heating at 1200° gives much more carbide, yet is unaffected by the Krupp test. Other examples are cited. Where prolonged heating in the dissociation range in service occurs, the test is worthless; for shorter periods, as in welding, it has some value as a forecast of service results. WLC (4)

Corrosion costs industry many thousands of dollars. Are you keeping up-to-date on this important subject?

The Effect of Sulphur and Phosphorus on the Corrosion of Iron. L. Tronstad & J. Sejersted. *Iron & Steel Institute, Advance Copy* No. 13, May 1933, 12 pages. Corrosion was studied by weight loss in NaCl solution, determination of O absorption in a solution containing NaCl, $K_2Cr_2O_7$, and CO_2, and by microscopic examination of the sample in the corroding medium. One series of steels contained 0.4% C and from 0.011 to 0.030% P. Another contained the same amount of C and from 0.013 to 0.040% S. Increasing P had no measurable effect on rate of corrosion, but the corrosion rate increased as the S content increased. Microscopic examination indicated that attack began at some of the sulphide inclusions. Other sulphide inclusions were not attacked. The active inclusions seemed to act as cathodes for corrosion of the hydrogen-evolution type. It is possible that crevices in or around the inclusions were responsible for the attack observed. 12 references. JLG (4)

Steel Sheet Piling in Good Condition after 19 Years. J. S. Unger. *Steel,* Vol. 91, July 25, 1932, pages 26-28. A section of piling made of open-hearth sheet steel was removed from the foundations of a bridge in Pittsburgh and found to be in surprisingly good condition after 19 years' exposure to the waters of the Monongahela River. The zone of greatest corrosion was at or near the water line. This region showed a deterioration of less than 1% annually while the totally submerged portion showed practically no deterioration. JN (4)

Liner Plates 18 Years Old Show Little Corrosion. J. S. Unger. *Engineering News-Record,* Vol. 110, Mar. 16, 1933, pages 337-338. Steel segmental liner plates removed from Passaic Valley sewer, Newark, N. J., show insignificant corrosion after 18 years in earth. Plates were ordinary O.H. steel with only a very small amount of Cu. Outside surface was coated with hard dark brown coating of rust mixed with sand which was water-resistant and adhered almost like enamel. Analysis of this scale showed ferric oxide 20.02%, silica 74.22%, alumina 1.42%. Very little pitting was noted. CBJ (4)

Electrolytic Oxidation of Aluminum. (Die elektrolytische Oxydation von Aluminium.) E. Herrmann. *Schweizerische Technische Zeitschrift,* Vol. 30, May 11, 1933, pages 285-291. Alumilite method is described. The chemical and physical properties of the oxide surface layer, the subsequent treatments and the applications are given. GN (4)

Residual-Current Measurements in Control of Metal Solution in Milk. H. T. Gebhardt & H. H. Sommer. *Industrial & Engineering Chemistry, Analytical Edition,* Vol. 3, Oct. 15, 1931, pages 414-418. Solution of Cu in milk occurs through action of local elements in which cathode consists of passive areas. Corrosion elements which are active in Cu solution in milk may be studied by means of model elements, using Cu anodes, and Pt or Au cathodes, or by using bright and oxidized Cu electrodes. For Cu, current gives a qualitative measure of solution rate under various conditions. From current the amount of Cu dissolving in the milk may be calculated with fair approximation to the gravimetrically determined values. The solution of Ni may be studied probably in a similar manner as Cu. For other metals the current measurement gives a qualitative indication of the probable solution rate, but the correct interpretation of the observed current requires more investigation. The principle of the oxidimeter of Toedt, which was used mainly to measure the corrosion rate of Fe and steel, may be used successfully for measuring the solution rate of Cu. Therefore, it is claimed, residual-current measurements may be used in the study of Cu solution in practice. MEH (4)

Metal Ware and the Ceramist's Problem. H. W. Gillett. *Ceramic Age,* Vol. 21, Jan. 1933, pages 6-8. Particular problems of wear resistance of metals used in ceramic industry such as tools, dies, equipment are discussed. Corrosion, abrasion, impact are often encountered and carbides of W, Mo, Ta, V and Cr find widest application. 10 references. Ha (4)

Corrosion II. (Korrosion II.) Transactions of the Corrosion Conference 1932, Berlin, under the auspices of Verein deutscher Ingenieure, Verein deutscher Eisenhüttenleute, Verein deutscher Chemiker and the Deutsche Gesellschaft für Metallkunde. VDI—Verlag, Berlin, 1933. Paper, 5¾x8¼ inches, 61 pages. Price 4 RM. This book contains the articles which were read at the Second Corrosion Conference together with the discussion which was brought up at the meeting. The papers, which have been abstracted individually in *Metals & Alloys,* were: Ueber die Bedeutung der chemischen Reaktionen bei der Korrosion der Metalle by G. Schikorr, Der Einfluss des Untergrundes auf das Verhalten der Anstriche by E. K. O. Schmidt, Gesichtpunkte für die Abgrenzung der Anwendungen von Oellack und Nitrozelluloselack by H. Wolff, Email als Korrosionsschutz by H. Salmang, Zement und Beton als Rostschutz by R. Grün, Die Phosphatrostschutzverfahren by A. Burkhardt and Kautschukderivate als Korrosionsschutz by H. Miedel. (4)-B-

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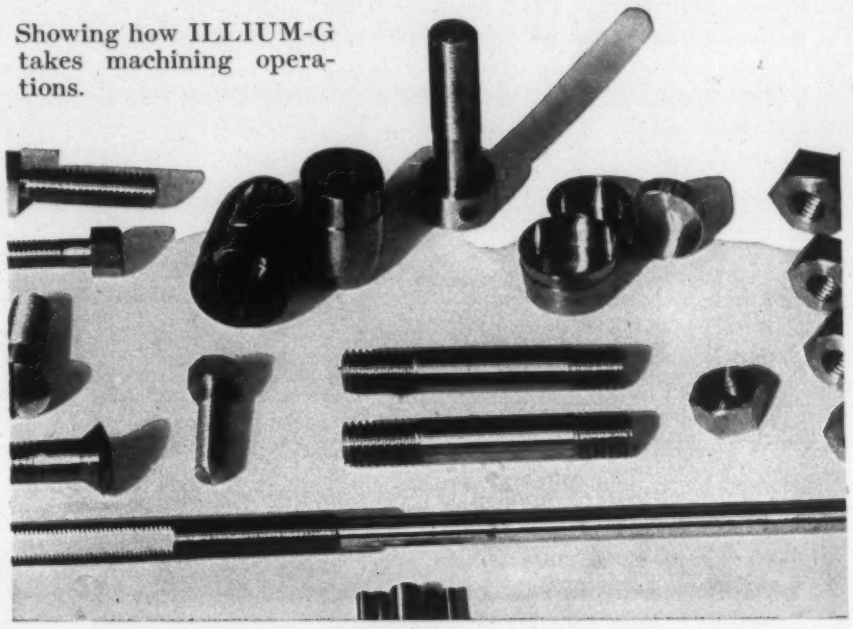

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STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Alloys of Platinum with Copper. (Ueber Legierungen des Platins mit Kupfer.) N. S. Kurnakow & W. A. Nemilow. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 210, Jan. 1933, pages 1-12. Investigation of this system showed that Pt and Cu form at temperatures above 800° C. a continuous series of solid solutions; in 50-50 alloy the solid solution decomposes and compound Pt-Cu is precipitated. An interruption of continuity of solid solution occurs from 20 to 25% Pt at about 500° C. which becomes noticeable in the thermal analysis. Transformations, hardness, microstructure and electric resistance were determined for the whole series and are given in tables. 15 references. Ha (5a)

Alloys of Platinum with Nickel. (Ueber Legierungen des Platins mit Nickel.) N. S. Kurnakow & W. A. Nemilow. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 210, Jan. 1933, pages 13-20. Pt forms with Ni a series of solid solutions, one group in alloys with a Pt content up to 20% and another above 20%; the transition point between the 2 groups is designated by a discontinuity in the hardness curve. Chemical compounds could not be found in this system. Hardness, microstructure, and electric resistance were determined over the whole range and the results are given in tables. 11 references. Ha (5a)

Binary Systems Cobalt-Tungsten and Cobalt Molybdenum. (Die Zweistoffsysteme Kobalt-Wolfram und Kobalt-Molybdän.) W. Köster & W. Tonn. *Zeitschrift für Metallkunde,* Vol. 24, Dec. 1932, pages 296-299. The constitution diagrams for the Co-W and Co-Mo systems were studied by means of dilatometric, magnetic and microscopic observations, especially with respect to the course (with composition change) of the polymorphic and magnetic transformations in Co, and the extent of the miscibility gaps in the solid state between the homogeneous Co-rich terminal solid solutions and the compounds CoW and CoMo. Both W and Mo raise the temperature of the allotropic transformation in pure Co; W from 400° to 1040° C. (the beginning of transformation on cooling) at 28% W, and Mo from 400° to 930° at 20% Mo, respectively. The magnetic transformation in Co is depressed by both W and Mo from 1140° to approximately 200°, at compositions of approximately 40% W and 20% Mo. The microstructures are illustrated, the changes in magnetization and hardness shown by diagrams, and the constitutions of the two systems represented by temperature-composition diagrams. Alloys in both systems harden greatly on quenching from 1300° and annealing for short periods in the range 600-900° C. RFM (5a)

Ternary System Cobalt-Chromium-Tungsten. (Das Dreistoffsystem Kobalt-Chrom-Wolfram.) W. Köster. *Zeitschrift für Metallkunde,* Vol. 25, Jan. 1933, pages 22-27. Ternary system Co-Cr-W was studied by means of thermal analysis and observations of structure, up to 50% W. The results are shown in a series of diagrams of sections of the ternary system at 0, 5, 15, 20, 30, 40% W, and by ternary diagrams and a space model of the ternary system. The structures are illustrated by a number of photomicrographs. Precipitation hardening obtains in alloys containing the $\gamma + \theta$ phases. As in the Co-W alloys maximum precipitation hardening is produced by a short anneal at 800°-900° C. Longer times of annealing are required for maximum precipitation hardening at low W-contents. The greatest hardness, 600 Brinell, was obtained in an alloy with 30% W—10% Cr—upon heating to 800°. Alloys of 20 to 50% W and up to 20% Cr, hardened by precipitation, show good properties as cutting tool materials. RFM (5a)

Microscopic Study of Effects of Heat Treatment Upon Ferrite Banding in Steel. Wilber E. Harvey & Bradley Stoughton. *Transactions American Society for Steel Treating,* Vol. 20, Aug. 1932, pages 177-192. Previously abstracted as Preprint No. 30, 1931. See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 7. Presented with discussion. WLC (5a)

Formation of Columnar Crystals in Steel Sheets after Normalisation. F. Kinsky. *Iron & Steel Institute, Advance Copy* No. 7, May 1933, 13 pages. A study was undertaken to determine the conditions responsible for formation of columnar crystals in normalized steel on box annealing. Experiments were made with 12-and 20-gage sheet containing 0.085% C. Specimens were normalized at various temperatures and cooled at different rates. Columnar crystals do not appear until C content has been reduced by decarburization until it is below that soluble in ferrite at annealing temperature. Decarburization is more rapid in a normalized air-cooled sheet than in a normalized furnace-cooled sheet. Abnormal grain growth takes place only in the homogeneous ferrite. Crystal growth cannot take place when the C content is greater than that soluble in ferrite at the annealing temperature and material is in a reducing or neutral atmosphere. Formation of large columnar crystals is made possible by thermal intercrystalline strains resulting from a rapid passage through the region of maximum segregation of α iron. 12 references. JLG (5a)

Structure & X-Ray Analysis (5b)

Grain Boundary Effects as a Factor in Heterogeneous Equilibrium of Alloy Systems. Arthur Phillips & R. M. Brick. *Journal Franklin Institute,* Vol. 215, May 1933, pages 557-578. Solubility limits in single crystals of several sizes and of polycrystalline aggregates are studied, chiefly by X-ray methods. Al-rich Cu alloys made from (99.97%) Al and exceptionally pure cathode Cu were used. The alloys contained from 1.02-5.65% Cu. The single crystal wires were prepared by the stretch-anneal method, stretching from 2-4% and annealed at 450° C. from 4-24 hrs. followed by quenching (media not given). The lattice parameter values were determined on all alloys immediately after quenching and after aging. X-ray determinations were made on specimens of both single crystals and powder. The work is compared with similar work published in the literature. The results indicate that the grain boundary factor may be of fundamental importance in establishing constitutional relationships. The prediction is made that grain boundary effects, previously viewed as of theoretical interest only, will acquire a practical significance. As applying to steel, the idea is advanced that the effective grain size (austenite) seems to be the most potent single factor influencing hardenability. The finer the grain size the more rapid is the transformation to fine pearlite and correspondingly the lower the hardenability. DTR + WAT (5b)

X-Ray Testing of Welds. A. St. John. *Paper* presented before the *International Acetylene Association,* Philadelphia, Nov. 1932, 4 pages; *Welding Journal,* Vol. 30, Feb. 1933, pages 52-53. Gives the history of the application of X-rays in weld inspection, describes the apparatus used, the results obtainable. TEJ + Ha (5b)

Does Change of Lattice Constants During Formation of Solid Solutions Depend on Grain Size? (Hängt die Änderung der Gitterkonstanten bei Mischkristallbildung von der Korngrösse ab?) Arthur Phillips & R. M. Brick. *Metallwirtschaft,* Vol. 12, Mar. 24, 1933, pages 161-162. Lattice constants of Al-Cu alloys containing up to 5.7% Cu in form of fine grained wire, coarse grained wire, single crystal wire, and single crystal powder of two grain sizes, were determined by X-ray precision measurements. Al of highest purity was used. Solubility limits were determined and results were confirmed by density and electrical conductivity measurements. It was found that change in lattice constants depends on grain size, results being similar to those obtained by Wiest on Cu-Ag alloys. For instance lattice constant of a fine grained wire containing 4.0% dissolved Cu equals that of coarse grained wire containing 4.8% Cu and single crystal wire containing 5.6% Cu. Detailed results will be published later. 3 references. CEM (5b)

PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

Impact Tests on Electrically Welded and Riveted I-Beams. (Schlagversuche an elektrogeschweissten und genieteten I-Trägern.) O. J. Hoppe. *Elektroschweissung*, Vol. 3, Oct. 1932, page 195. I-beams tested were 324 mm. high, distance of supports 2 m., comprising 3 groups, (1) beams without reinforcement, (2) beams with reinforcement in middle, (3) I-beams reinforced with beam sections. Results show that resistance against dynamic loads of electrically welded beams is about same as against static loads. In comparison with riveted beams welded ones proved superior in dynamically testing. GN (6)

Rockwell Hardness Unchanged by Magnetic Treatment. R. H. Harrington. *Metal Progress*, Vol. 21, June 1932, pages 40-41. In an effort to verify work of E. G. Herbert on increase in hardness resulting from rotating steels in a magnetic field (*Metal Progress*, Apr. 1932) writer in consultation with W. E. Ruder, repeated Herbert's experiments using a high speed steel (14% W, 4% Cr, 1% V). No increase in hardness appeared as revealed by a Rockwell tester. Original determinations by Herbert were made with Herbert pendulum machine. WLC (6)

Experiments on the Nature of Ferromagnetism. Francis Bitter. *Physical Review*, Vol. 41, Aug. 1932, pages 507-515. Irregularities in magnetization of ferromagnetic crystals were studied by means of magnetic Fe_2O_3 particles about 1μ in diameter suspended in ethyl acetate. On Fe crystals the particles settled along parallel lines spaced about 0.1 mm. apart and more or less at right angles to applied field. On Ni crystals the pattern is similar, but the lines split up into more complicated structures as applied field is increased. On Co crystals straight lines are obtained on some crystals, and spotty patterns on others. Spots arrange themselves in rows when crystals are magnetized. Patterns can be destroyed by relatively slight surface strains. There is some evidence that in straight line patterns the direction of the lines is related to direction of magnetization. An explanation of these effects is not known. WAT (6)

Torsion Tests on Welded Square Edged Tubes. (Torsionsversuche an geschweissten Vierkantrohren.) Kurt Hegewald. *Die Werkzeugmaschine*, Vol. 37, Jan. 15, 1933, pages 9-10. Tubes tested, 550 mm. long, were made by welding together either 2 angles or 2 channels. In both cases cracks developed transverse to seam, i.e. vertical to longitudinal fiber direction. These hollow bodies proved to be highly plastic. Welds were made with bare electrodes and proved to be sound. Method of welding, best production method and capacities attained are described. Fields of application of such tubes with a high resistance to bending and torsion are discussed. GN (6)

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The Technique of Measuring Vibrations. (Schwingungsmesstechnik.) E. Lehr. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Oct. 29, 1932, pages 1065-1073. Vibration measuring technique deals with stationary or permanent vibrations, and with irregular vibration phenomena induced by impulses. Instruments used for measurements have been developed from seismological instruments and highly perfected. Concussion meters, dynamic longation meters, mechanical phasometers, instruments for exciting impulses, statistical methods of evaluating results from frequency curve, and calibration of instruments are described, and further possible developments discussed. 73 references. Ha (6)

Relations Among Elasticity, Plasticity, Toughness and Brittleness. Practical Means of Characterizing Them. (Relations entre l'élasticité et la plasticité, la ténacité et la fragilité. Moyens pratiques de les caractériser.) P. Regnauld. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 544-547. Very brief discussion of these properties and the way they are determined. HWG (6)

Plasticity as Applied to Steel Products. A. Nadai. *Proceedings Engineers' Society of Western Pennsylvania*, Vol. 48, Mar. 1932, pages 65-72; discussion, pages 72-79. Commercial aspects involved in problem of plasticity are considered in introduction. Flow figures in mild steel bodies subjected to compressive strength, to 2 concentrated loads, to cylindrical punching, and slip lines in twisted steel bars of various cross sections are dealt with. Testing apparatus demonstrating membrane analogy of torsion and surfaces of constant flow, and results obtained therewith are considered. Structural changes produced by locally concentrated pressures in steel can also be studied by means of model tests (bakelite, celluloid, paraffine, glass). EF (6)

Plastic Torsion. A. Nadai. *Transactions American Society of Mechanical Engineers*, Vol. 53, 1931, Applied Mechanics, pages 29-38. Stress distribution in a bar which has been twisted to limit of plasticity is experimentally determined and locally varying distributions of stress for a transition from a state of equilibrium with purely elastic deformations to one with plastic deformations is mathematically analyzed. It is shown that contour lines of deflecting torque can be represented very accurately by sand heaps of cross-sectional area of base; stress lines for complete yielding are exactly contour lines of surface of constant slope erected above boundary line of cross-sectional area of twisted bar. Many photographs of such model sand heaps over different cross sections and etching of plastic regions illustrate theory. Ha (6)

The Calibration of Testing Machines. H. F. Moore. *International Association for Testing Materials, Zurich Meeting, 1931*, Vol. 2, 1932, pages 482-491. Calibration by proving levers and standard weights and by elastic bars or rings is discussed. The 100,000 lb. dead weight outfit of the Bureau of Standards for calibrating proving rings is described. HWG (6)

Significance of Impact Figure in Testing of Iron and Steel. (Slagprovet och dess betydelse vid materialkontroll a Jarn och stal.) G. Malmberg. *Jernkontorets Annaler*, Vol. 114, Sept. 1932, pages 124-206. Following subjects are discussed: Historical development of present specifications, pendulum hammer for breaking test samples, law of proportional test pieces, granular and foggy breaks, brittleness to heat and cold, effect of varying experimental conditions, comparison of various shaped test pieces, and value of test as a buying specification. 40 references. HCD (6)

Test Results and Service Values of Materials. H. F. Moore. *Journal Western Society of Engineers*, Vol. 37, Aug. 1932, Part I, pages 188-193. See *Metals & Alloys*, Vol. 3, June 1932, page MA 169. WHB (6)

Possibilities of a Calculation of Strength true to Actual Conditions. (Wege zu einer wirklichkeitsgetreuen Festigkeitsrechnung.) O. Foeppl & P. Ludwik. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Apr. 2, 1932, pages 345-346. Exchange of remarks about application of test results of measuring damping constant of materials to actual behavior. Method of polishing a surface by grinding or pressing is a special example on which behavior of a material with respect to damping is illustrated. Ha (6)

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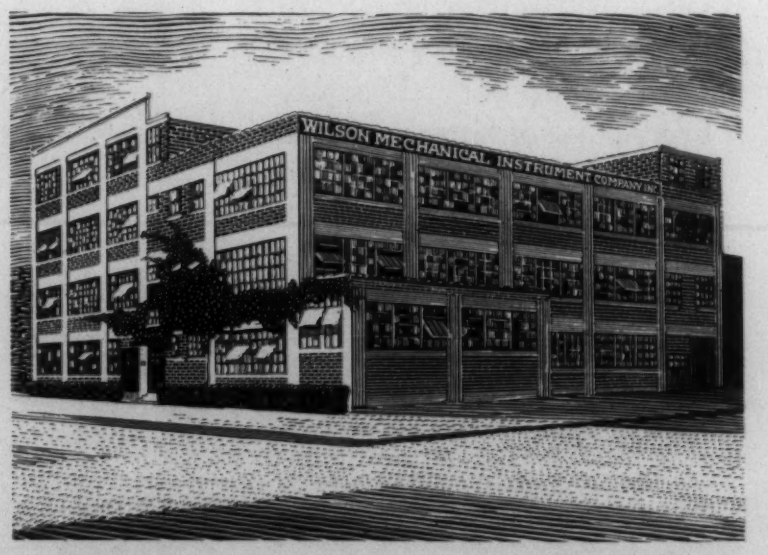

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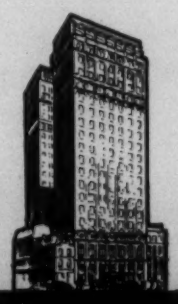

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Studies on Form and Arrangement of Ferromagnetic Precipitates by use of Magnetic Balance. (Untersuchung über Form und Anordnung von ferromagnetischen Ausscheidungen mit Hilfe der magnetischen Waage.) E. Gerold. *Zeitschrift für Metallkunde*, Vol. 24, Oct. 1932, pages 255-257. Use of magnetic balance in studying precipitation of magnetic phases from non-magnetic. Magnetization curves are given for different ratios of length to cross-section of a ferromagnetic sample taken in a magnetic balance with length of piece always in one position with respect to poles of electromagnet. For precipitation of a magnetic phase from a non-magnetic 2 cases are distinguished: where precipitating phase is continuous (grain-boundary envelopes), and where it is discontinuous (precipitation in discrete particles within the grain). In second case precipitated particles are without mutual magnetic effect and magnetization curve is independent of orientation of piece with respect to magnet poles; precipitation of Fe from Cu containing 2% Fe falls in this class. Cold-working produces a preferred orientation of the precipitated particles with resultant displacement of the magnetization curve. Pieces cut from a cold-rolled sample with preferred orientation of precipitate orient themselves in magnetic field in such a way that rolling direction assumes a direction parallel to field. RFM (6)

Friction and Wear Tests on Solid Dry Bodies. H. W. Gillett. *Metals & Alloys*, Vol. 2, Feb. 1931, pages 95-96. Extended abstract of thesis by E. Zimmerman. Covers work on wear of cast irons and a number of white metals. Testing equipment is described and data given on wear and coefficient of friction. Dry wear appears to be independent of properties of material and is a function of the pressure. WLC (6)

Methods of Testing. Report of Committee E-1, W. H. Fulweiler, Chairman, June 1932 meeting *American Society for Testing Materials. Preprint* No. 4, 9 pages. Progress reports of subcommittees. Section on Effect of Speed of Testing reported results of a questionnaire sent to 217 laboratories on current practice in speed of testing. Rate of application of load in testing steel in majority of cases ranged from 5000 to 130,000 lbs./in.^{2}/min. with a fewer number up to 1,500,000; with wrought Fe largest number was from 30,000 to 40,000 but ranged from 1000 to 1,000,000; with cast Fe 15 tests were from 20,000 to 30,000 and 1 at 30,000 to 40,000; Al alloys ranged from 1000 to 110,000 with largest number 40,000 to 50,000; with Cu alloys range was from 5000 to 140,000 with majority at 40,000 to 50,000. Work is under way to bring conflicting views into agreement. VVK (6)

Influence of Position of Test Specimen in the Steel Casting on the Tensile Values. (Einfluss der Lage des Probestabes im Stahlgussstück auf die Zerreisswerte.) F. H. Heinrich. *Stahl und Eisen*, Vol. 52, Oct. 20, 1932, pages 1017-1020. When test specimens are taken from the work piece for determining the quality of the casting, values obtained on this specimen do not represent actual quality of the casting. Extensive tests have shown that position from which sample was taken is of extreme importance on tensile test values. Duration of annealing must be adapted to wall thickness. If casting boxes do not fit exactly, disturbances in crystallization may occur in joint which reduce the tensile strength. Critical wall thickness depends to a great extent on pouring temperature and method of molding. Results are given in curves and tables. Ha (6)

Test Bars of Varying Size for Cast Iron. A. H. Dierker. *Engineering Experiment Station News, Ohio State University*, Vol. 4, Oct. 1932, pages 8-10. As mechanical properties of a gray Fe casting vary with rate of cooling and shape of casting a type of test bar has been developed the test results from which are directly applicable to design of commercial castings. Series comprises 4 sizes, ¼″ × ½″, ½″ × 1″, 1″ × 2″ and 1½″ × 3″; their dimensions are such that a high stress concentration at point where gripping surface joined parallel section and where ordinarily the break occurred is avoided. In all test bars of series there is a definite relation between length of parallel section and width and thickness. Exact dimensions of each size are tabulated. Ha (6)

Determination of Stress Concentration in Screw Threads by the Photo-Elastic Method. Stanley G. Hall. *Bulletin* 245, *Engineering Experiment Station, University of Illinois*, May 29, 1932, 20 pages. Tests of stress-distribution in celluloid models representing longitudinal strips from screw threads were made using polarized light. Optical equipment consisted of a petrographic microscope fitted with a Babinet compensator eye piece. Specimens representing 6″ U. S. Standard threads and 6″ Whitworth threads, and specimens double this size were tested. Results of tests show stress at root of American Standards thread to be about 40% greater than that at root of Whitworth thread for both sizes of specimens. Probably actual mechanical tests of 2 threads would show a smaller difference, as is usual for mechanical tests of pieces with heavy stress concentration. HFM (6)

The Herbert Pendulum Hardness Tester. P. L. Henderson. *Commonwealth Engineer*, Vol. 19, Mar. 1, 1932, pages 289-292. A detailed description of this testing machine is given and its operation explained. The author reporting on his experiments at Sidney University, advises making the swing smaller than recommended by the instrument's makers, i.e. instead of 10-15 scale division only about 5 for glass and 3 for metals. Hardness values obtained with a diamond ball proved to be lower than those obtained with a steel ball. It is very necessary that the surface of the specimen be level. From the author's experiments it seems that, for most metals, the readings will be correct as long as the surface is within half a degree of being level. The pendulum should swing in the direction of the polish but not across it. Except 4 pure metals, all of the 26 different materials tested were steel. The object was to correlate Brinell hardness, B, to Herbert diamond hardness, T, which yielded the following formula: $B = 20\ (T - 5)$ Taking the conversion factor of 1.35 for the higher steel ball hardness into account $T = 0.067\ B + 7$. A diagram presents the results of 5 other investigators on this subject. Next Henderson reports on his tests at elevated temperatures. Readings with the Herbert pendulum machine have been taken at intervals from 10°-50° C. up to a maximum temperature of 800° C. on 8 different steels, which reveal the remarkable stability of some tool steels. The writer warmly recommends the use of the Herbert instrument for testing hardness at elevated temperatures. WH (6)

Dynamic Breaking Tests of Airplane Parts. H. Hertel. *National Advisory Committee for Aeronautics, Technical Memorandum* No. 698, 1933, 42 pages. See "Dynamic Fracture Tests on Airplane Framework," *Metals & Alloys*, Vol. 3, June 1932, page MA 168. HWG (6)

Weld Testing in Germany, the Schmuckler Testing Instrument. (Über Schweissprüfungen in Deutschland und das Schmuckler-Prüfgerät.) Hermann Albinus. *Schweizerische Bauzeitung*, Vol. 100, Nov. 26, 1932, pages 290-292. An account is given of various methods suggested and used for testing welds; mechanical tests, electro-magnetic and acoustic testing methods are considered. Usefulness of Schmuckler instrument is pointed out. Recently suggested method by Pohl is referred to (*Stahl und Eisen*, Vol. 52, Sept. 22, 1932, pages 917-922.) GN (6)

The Application of the Diamond Pyramid Indentation Test to Copper and Copper-Rich Alloys in the Form of Thin Strip. Maurice Cook & Eustace C. Larke. *Institute of Metals, Advance Copy* No. 628, Mar. 1933, 12 pages. Diamond-pyramid hardness tests were made on Cu, brass and bronze sheet as thin as 0.0025″ and in several tempers. Loads from 0.5 to 10 kg. were used. It was concluded that it was not desirable to use loads under 5 kg. It is difficult to measure impressions made with smaller loads, and surface condition appreciably influences hardness value obtained. Using a hardened-steel anvil it was found that Cu of any temper could be tested with a 10-kg. load for specimens at least 0.010″ thick, and with a 5-kg. load for specimens 0.005″ thick. Brass and bronze of any temper and as thin as 0.005″ could be tested with a 10-kg. load. Variations in diamond-pyramid hardness of anvil between 140 and 700 had little effect on hardness results except with material 0.005″ thick in hard condition. JLG (6)

Fatigue of Metals & Alloys (6f)

Alternating Strength of Steels Used in Automobile Construction. (Wechselfestigkeit der im Automobilbau verwendeten Stähle.) W. Herold. *Automobiltechnische Zeitschrift,* Vol. 36, Jan. 10, 1933, pages 4-9; Jan. 25, 1933, pages 40-42. The strength of a material for alternating stresses is of particular importance in all cases where lightness of construction must be connected with absolute safety, as in aviation, automobiles, etc. 3 kinds of repeated stresses are distinguished and discussed: (1) pure oscillating (vibrating stress) which oscillates between 2 equally great amplitudes of stress of different sign, for instance ± 22 kg./mm.2; (2) fluctuating stress, in which the 2 amplitude values are different and also can be of different sign; this is mathematically expressed by a preliminary existing stress (Vorspannung), on which is superimposed an alternating stress as defined under (1); this fluctuating stress represents the most general kind of alternating stress; it may be represented by ± 14/30 kg./mm.2; (3) the endurance flow limit, which corresponds to a purely static stress on which are superimposed cycles of reversed stress of extremely small range. The endurance flow limit is often defined as that stress referred to the initial state for which the elongation remains constant at 0.2% permanent deformation and is not exceeded even after infinitely long times. Investigations with different kinds of alternating stresses have shown the following relations between them: the torsional oscillating strength is equal to 0.575 of the bending oscillating strength; the notch-sensitivity for oscillating stresses is also 0.575 of the notch-sensitivity for bending; the oscillating strength for tension-compression is 0.693 of the bending strength, but this ratio increases for oscillations of higher frequency than about 3000 per min. and is 10-20% greater for 30000 cycles/min. When calculating the dimensions of a material for a given case the safety factor must be selected separately for the static and the oscillating stress of which the alternating stress is composed. Diagrams illustrate and give values for the different stresses, and examples are described. (Note by H. F. Moore: Tests at the Bureau of Standards and the British National Physical Laboratory give a higher value than 0.693 for ratio of endurance limit in reversed axial stress (tension-compression) to endurance limit in reversed bending). 35 references. Ha (6f)

What is this thing called Fatigue?

These abstracts are prepared in cooperation with the A. S. T. M. Research Committee on Fatigue of Metals.

Fatigue Test on Cast Iron. C. H. Bulleid. *Bulletin British Cast Iron Research Association,* Vol. 3, Oct. 1932, pages 150-152. Following up some previous experiments on fatigue of cast Fe further tests have been made which, although not absolutely conclusive yet show that all changes in the Fe which result in increased graphite (increased Si, increased thickness, etc.) diminish fatigue strength and vice versa, just as in the case of static tests. Since most engineering structures subject to fluctuating stresses fail in fatigue the material should have a high ratio of fatigue strength to tensile strength. (Note by H. F. Moore: Tests by Kommers indicate that the better grades of cast iron have about the same ratio of fatigue strength as does steel, but that for poorer grades of cast iron the ratio is lower.) Ha (6f)

Fatigue Testing Machines. (Prüfmaschinen für Ermüdungsversuche an Metallen.) F. Rüfernacht & René Leonhard. *Schweizerische Technische Zeitschrift,* Vol. 30, Apr. 4, 1933, pages 197-204. The lack of standardization in construction of fatigue testing machines is pointed out. Role which fatigue limit plays in properly determining structural elements is emphasized. A few modern fatigue testing machines for various types of loading are described. GN (6f)

Modern Fatigue Testing Machines. (Moderne dynamische Prüfmaschinen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Feb. 12, 1933, pages 82-84; Feb. 19, 1933, pages 98-99. Gives a detailed account of various types of modern fatigue testing machines, as tension-compression machines for highly frequent loads, endurance bending machines, oscillating torsion and oscillating bending fatigue testing machines, low frequency tension-compression fatigue machines of the Schenck Co., Darmstadt, the Maschinenfabrik Augsburg-Nürnberg and the Losenhausen Works, Düsseldorf. Dynamic bridge testing and soil testing machines are also briefly considered. GN (6f)

The Welded Joint under Dynamic Loading. (Die Schweissverbindung bei dynamischer Beanspruchung.) G. Bierett. *Die Elektroschweissung,* Vol. 4, Apr. 1933, pages 61-70; May 1933, pages 94-97. Report from Staatliche Materialprüfungsanstalt, Berlin. Includes discussion. Behavior of welded joints in fatigue tests necessitates a discussion of special conditions that become effective in endurance tests. The 2 principal points that play a part are discussed at length in this paper (1) mechanical behavior of material is chiefly of importance in butt welds, (2) construction problem is predominant in flank seams. Stress distribution in these various types of joints and methods of improving it are considered. Mathematical calculations are given. Paper which refers extensively to results of fatigue tests in recent years goes to show that type of construction (shape and arrangement of welds) plays most important role in fatigue tests of welds. It is emphasized that welding engineer needs a study of these internal conditions of welds. Specifications on welding should take into account these conditions. GN(6f)

The Fatigue of Mild Steel, Including Steel Castings and Forgings. *Railway Engineer,* Vol. 53, May 1932, page 166. Brief reference is made to report of a committee appointed by North-East Coast Institution of Engineers & Shipbuilders. At ordinary temperatures, breakdown of metals under repeated stress is not due to changes in crystalline structure of metal. Fatigue failures occur through the crystals and not along crystal boundaries. Further desirable research work is pointed out and definitions of term "fatigue" are set forth. WH (6f)

Mechanical Principles of Fatigue Failure of Welded Constructions. (Zur Klärung der mechanischen Grundlagen des Dauerbruchs geschweisster Konstruktionen.) G. Bierett. *Elektroschweissung,* Vol. 4, Feb. 1933, pages 21-27. Discusses fatigue in welded constructions with special reference to stresses occurring. Whereas investigations on drilled bars and riveted joints show a relatively favorable result of fatigue properties, ratio of static tensile strength to fatigue properties of welded joints is rather unfavorable. Both types of construction show unfavorable stress laws due to notch effects. These laws, however, cannot differ so much as to explain the different behavior in fatigue tests. The different behavior, as the author shows in his discussion, is to be traced to technological effects. The mechanical conditions for the fatigue properties of welded joints are derived and discussed at length. 9 references. GN (6f)

The Resistance of Copper and Its Alloys to Repeated Stress. Part IV. The Bronzes and Special Alloys. H. W. Gillett. *Metals & Alloys,* Vol. 3, Dec. 1932, pages 275-280. Condenses data from 28 references and shows in tables best data available on resistance of various Cu alloys, phosphor, Mn, and Al bronzes, and Cu-Ni alloys to fatigue. WLC (6f)

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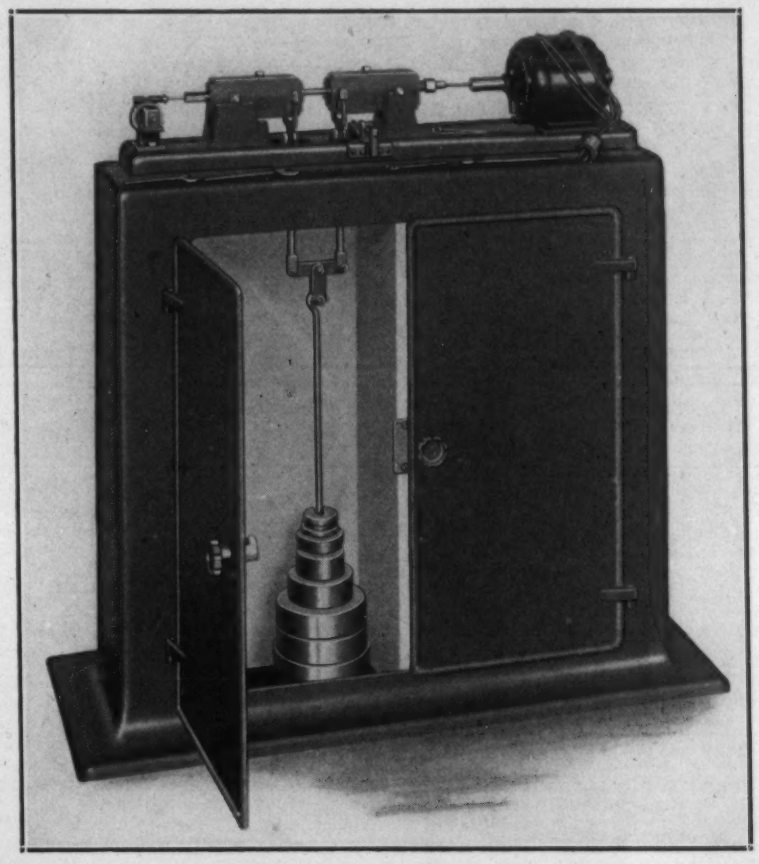

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ELECTRO-CHEMISTRY (7)

Electroplating (7a)

Commercial Cadmium Oxide. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, May 13, 1932, pages 472-473. A brief discussion of the quality requirements for commercial CdO used in electroplating. Recommended specifications are: (1) a minimum Cd content of 84.0%, (2) complete solubility in NaCN solution, (3) absence of Fe, Zn, S, dirt, hard lumps, etc., and (4) safe and adequate packaging. JN (7a)

Sodium-Bisulphite Powder. Quality Requirements for Electroplating. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Apr. 29, 1932, page 433. Na bisulphite is used in electroplating baths for reducing cupric salts in Cu cyanide solutions, and for counteracting oxidation during operation. Commercial "Na bisulphite powder" is really Na metabisulphite, $Na_2S_2O_5$. Impurities present are moisture, Na_2SO_3 and Na_2SO_4. A minimum content of 59% SO_2, equivalent to 88% $Na_2S_2O_5$ is recommended. JN (7a)

Platinum Plating. *Metal Industry*, London, Vol. 41, Aug. 12, 1932, page 160. Mention is made of a newly discovered Pt plating process but no details are given. Besides being used for jewelry it is used for Pt plating of Cu in electrical apparatus such as timing gear, switch gear, relays, etc. and also for surgical instruments. Ha (7a)

The Possibility of Standardizing Electrodeposits. *Metal Industry*, London, Vol. 41, Oct. 28, 1932, pages 427-428. British Electroplaters' & Depositors' Technical Society discussed advisability and difficulties of electroplating. Comparisons were made with regulations in other countries. Special reference was made to tinplate industry. Ha (7a)

Have you a plating problem?
If you have, these abstracts will help you.

The Use of the Preece Test, Especially for Electrolytic Zinc Coatings. (Über die Anwendung der Preece-Probe, besonders für die elektrolytische Verzinkung.) JÜRGEN FEISER. *Chemiker Zeitung*, Vol. 56, Oct. 19, 1932, pages 831-832. The Preece test is not as clearly defined as it should be. It gives no indication of the porosity, purity, adherence or brittleness of a Zn coating. It does satisfactorily show the uniformity of the deposit and generally also the weight of Zn per unit area. The weight is not always correct as it is affected by the amount of Fe dissolved in the Zn. The Preece test is not a fair comparison between hot dip galvanizing and Zn plating. On account of the greater purity, ductility and uniformity the electroplated coating thickness required for a given service is much less than the galvanized coating. CEM (7a)

The Electro-Deposition of Iron-Cobalt Alloys. Part I. S. GLASSTONE & J. C. SPEAKMAN. *Transactions Faraday Society*, Vol. 28, Oct. 1932, pages 733-740. Study was made of compositions of alloys deposited from well buffered solutions of definite pH containing various proportions of ferrous and Co sulphates over a range of current densities. From each solution, amount of Fe in deposit was found to increase with increasing current density until a maximum was attained, beyond which further increase in current density was without effect until very high values were reached when proportion of Fe decreased. Composition of alloy of maximum Fe content obtained from a solution containing a given proportion of Fe to Co is independent of pH value of solution, but always contains a larger proportion of Fe than solution unless at very low current densities. PRK (7a)

Simultaneous Electrolytic Precipitation of Iron, Copper and Nickel from Cyanide Baths. (Gleichzeitige Elektrolytische Fällung von Eisen, Kupfer und Nickel aus Zyanidbädern.) W. H. CREUTZFELDT. *Stahl und Eisen*, Vol. 52, Aug. 4,1932, page 765. Originally published by Lawrence E. Stout & Charles L. Faust in *Transactions American Electrochemical Society*, Vol. 60, 1931, pages 173-198. See *Metals & Alloys*, Vol. 3, Feb. 1932, page MA 38. DTR (7a)

The Electro-deposition of Nickel and Chromium. J. W. CUTHBERTSON. *Metallurgia*, Vol. 6, May 1932, pages 15-16; Vol. 7, Dec. 1932, pages 57-58. Gives somewhat detailed directions for commercial plating. JLG (7a)

Electrolytic Deposition of Polonium on Various Metals (Dépot électrolytique du polonium sur divers metaux). M. HAISSINSKY. *Comptes Rendus*, Vol. 194, May 30, 1932, pages 1917-1919. Critical potentials for deposition of Po on various metals were measured and tabulated with respect to a calomel electrode. Metals giving definite results (in solutions of given alkalinity) are Pt, Au, Cu, Ag, Sn, Ni. Variation of potential of cation of Po in an alkaline medium with pH and nature of cathode is probably due to part which H plays in process of discharge. Po, it is suggested, acts as a de-polarizing agent with respect to H. OWE (7a)

The Electrodeposition of Chromium from Trivalent Chromium Salt Solutions. Part I. Chromium Chloride and Chromium Sulphate Baths. Part II. Chromium Acetate, Oxalate and Tartrate Baths. HUBERT THOMAS STANLEY BRITTON & OLIVER BRENTWOOD WESTCOTT. *Transactions Faraday Society*, Vol. 28, Aug. 1932, pages 627-634. It is extremely difficult, if not impossible to deposit pure Cr from trivalent Cr salt solutions. Contamination due to basic matter always occurred and was deposited during initial stages of electrolysis. Most successful baths were those of high pH and contained Cr in as stable a complex as possible. Current efficiency of Cr deposition was exceedingly low. Increase of concentration, of current density and use of a diaphragm tended to give higher efficiencies, while increase in temperature gave poorer deposits. Regarding use of organic salts, oxalates were distinctly better than acetates or tartrates. PRK (7a)

Migration of Electrolytic Cadmium Deposits. (Das Einsinken elektrolytischer Kadmiumniederschläge.) E. BEUTEL & A. KUTZELNIGG. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Apr. 1, 1932, page 159. Thin Cd electrodeposits from cyanide bath on brass show that Cd travels into base metal. It is interpreted as diffusion effect. EF (7a)

Recovery of Silver and Gold from Plating Solutions. (Wiedergewinnung von Silber und Gold aus Lösungen und Abwässern.) K. BIHLMAIER. *Metallwaren Industrie und Galvano-Technik*, Vol. 29, Apr. 1, 1932, pages 143-145; Apr. 15, 1932, pages 169-171. Discusses chemical methods of recovering Au and Ag from acid and alkaline solutions and from those liquids which carry the noble metals in suspension. Following ways of disposing waste solutions are considered: (1) the solutions are sent to a separating plant, (2) preliminary preparation is done at plating plant and final recovery at precipitation shop, (3) entire work of recovering is done at plating plant itself. EF (7a)

Nickel Anode and Advances in its Production. (Die Nickelanode und Fortschritte in ihrer Herstellung.) R. JUSTH. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, July 1, 1932, pages 297-298. Drawbacks of cast anodes, which go readily into solution, are that they cause alkaline reaction of bath and show anode losses due to crumbling. Disadvantages of rolled anodes are that they render bath too acid and reduce too strongly its metal content. Attention is directed to hammered anodes which being relatively easily soluble, keep bath composition constant and do not become very porous on account of denser structure. EF (7a)

Chromium Plating Electrolytes. (Chrombadelectrolyte.) *Oberflächentechnik*, Vol. 9, Oct. 4, 1932, pages 199-201. Various bath compositions, from the first practical bath of Carveth-Curry up to the present, are reviewed. Influence of temperature on the bath voltage, current density and nature of deposit is illustrated by experiments and it is explained how a dense deposit of Cr can be obtained on intermediary deposits of other metals. Tests also show that Cr plating electrolytes have a much narrower range in which a certain kind of deposit is obtained than all other metal plating electrolytes, and differences of temperature and change of current can balance each other within not too wide limits. Ha (7a)

Indium in Plating Technique. (Indium in der Galvanotechnik.) *Oberflächentechnik*, Vol. 9, Nov. 1, 1932, pages 223-224. Describes several applications of In in plating solutions; In is now on market in commercial quantities at a price (1931) 3 times as high at Pt. When added to a plating bath it is said to increase hardness and durability of deposit. U. S. Patent 1,849,293 describes a process for depositing In electrolytically on Ag plated articles to prevent tarnishing; preparation of bath is described. In is produced in Germany mostly from residues of Zn ores. Industrially it has not yet found application. Ha (7a)

Covering Materials for Articles to be Nickelplated. (Abdeckstoffe für zu vernickelden Waren.) *Oberflächentechnik*, Vol. 9, Nov. 15, 1932, pages 229-230. If articles are to be Ni plated only at definite places the other places must be protected or covered with some material which prevents electrolytic deposition of Ni. Such materials must possess certain qualities from mechanical and chemical point of view which are discussed for oils, cellulose lacquers, waxes and paraffines. A good material is a mixture of 70 parts bitumen and 30 parts paraffine wax which will stand 35° C.; for higher temperatures up to 40° C., 50 parts mixture of gutta percha, resin, fir tar and 50 parts paraffine wax. For hot Ni baths, 55° to 60° C. lacquers are mostly used. Ha (7a)

Study of Tension in Cu Deposited Electrolytically in Presence of Certain Colloids (Étude des tensions dans le cuivre électrolytique déposé en présence de quelques colloides). P. JACQUET. *Comptes Rendus*, Vol. 195, Nov. 21, 1932, pages 952-954. Values of tensions are expressed in terms of mean displacement of end of cathode during 1 minute of electrolysis. Each colloid has a specific action on tension of the metallic deposit. Gelatine has most characteristic effect; below a concentration of 20 mgs./l. tensions (contractions) show a series of oscillations, and above this concentration an expansion is observed. The albumen of serum also has a large effect on deposit. Gum arabic and gum tragacanth have almost same action; above concentrations of 50 mgs./l. tensions are almost constant. Dextrin is almost without effect as is also glycocol at low concentrations. Results show that there is a certain parallelism between effect on metallic deposit and protective action of colloids. OWE (7a)

Possibility of Utilizing Chromium Anodes in Chromium Plating. (Über die Möglichkeit der Verwendung von Chromanoden bei der Verchromung.) J. KORPIUM. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, May 15, 1932, pages 227-228. According to writer, Cr enters solution as CrO_3. In this case current yield is 100%. Since cathodic current efficiency amounts to only 15%, CrO_3 content would markedly increase if Cr anodes would be used. In addition to this, Cr anode cannot oxidize Cr slats in contrast to Pb anodes. On combining Cr and Pb anodes, these drawbacks do not prevail and composition of bath remains constant. EF (7a)

Improved Apparatus for Chromium and Silver Plating. (Verbesserte Apparate für die galvanische Verchromung und Versilberung.) MANGOLD. *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Jan. 1, 1933, pages 9-10. L P W (Langbein-Pfanhauser Works, Leipzig) apparatus for Cr plating makes possible Cr plating of mass articles which has hitherto been impossible. GN (7a)

Electrolytic Lead Plating. (Elektrolytische Verbleiung.) H. KURREIN. *Werkstattstechnik*, Vol. 26, Dec. 1, 1932, pages 458-459. Tests have shown 34 g. Pb/m.^{2} sufficient for non-porous coating (tested with ferric cyanide). 100 g./m.^{2} equal to a coating of Pb 0.01 mm. thick were expected to withstand practical corrosion completely. This has proved true in numerous instances such as bridges, railway construction and many other parts strongly exposed to atmosphere, spray, etc. Internal stresses are lacking completely as contrasted to molten Pb which contracts 3.5% in solidifying. RFV (7a)

Chemical and Physical Actions in Chromium Plating Bath. MARVIN J. UDY. *Metal Progress*, Vol. 21, June 1932, pages 23-27. Typical bath employed in Cr plating contains 32 oz./gal. H_2CrO_4 and 0.4 oz./gal. H_2SO_4. H_2SO_4 is added to reduce a portion of chromate Cr to trivalent chromic condition necessary for formation of a cathode deposit. Unreduced chromate ions serve as "carriers" for trivalent positive ions. This bath operates at temperatures ranging from 75° to 140° F. and with a current density of 200 to 300 amp./ft.^{2} Some types of work, however, require densities as high as 1000 amp. Cathode efficiency varies from 10 to 35%. Anode efficiency with Cr anodes reaches 95%. This difference in anode and cathode current efficiency necessitates use of combination Pb and Cr anodes in which metals occur in ratio 5.5 Pb to 1 Cr, or application of pure Pb anodes and direct addition of chromic acid. Proportion of H_2CrO_4 to H_2SO_4 must be kept within close limits, and frequent analysis of solution is essential. Throwing power and current efficiency are low as compared with Ni and Cu work. Low efficiency results in formation of harmful gases and vapors which must be removed by adequate ventilating systems. Conforming anodes are extensively employed. WLC (7a)

The Structure of the Chromic Acid Plating Bath; The Theory of Chromium Deposition. CHARLES KASPER. *Bureau of Standards Journal of Research*, Vol. 9, Sept. 1932, pages 353-375. Structure of solutions that are of importance to theory of Cr deposition from chromic acid bath was investigated by cryoscopic and conductivity measurements, and absorption spectra. It was shown that first step in reduction of chromic acid is formation of Cr dichromate, $Cr_2(Cr_2O_7)_3$, a strong electrolyte which forms negative molecular ions. This compound is found not to exist in the "green" form. Next product of reduction is basic Cr chromate, $Cr(OH)_3 . Cr(OH)CrO_4$. This compound is a colloid, which may exist in relatively acid solutions. If sulphate is present, it forms chromic sulphate only the green form of which exists in chromic acid solutions. If basic colloid does not have its electrophoretic velocity reduced it coats cathode and prevents further reduction of chromic acid. Beneficial action of sulphate is caused by the fact that it lowers that velocity by adsorption. Sulphate reaches cathode film by being transported as a non-reactive positive molecular ion, $[Cr_4O(SO_4)_4(H_2O)_n]^{++}$. Above theory was confirmed by employing it to correlate facts and principles of Cr plating. WAT (7a)

How to Increase Efficiency of Plating Bath Solutions. (Wie kann man seine galvanischen Badlösungen vorteilhafter machen?) GEORGE NICOLAUS. *Deutsche Goldschmiedezeitung*, Vol. 35, Dec. 3, 1932, pages 494-495. Discusses points to be borne in mind for increasing durability of Au plating bath solutions. Main requirements are avoidance of contamination with foreign metals and any acid. Various causes of above mentioned contaminations are discussed. Author advises a preliminary plating in old Au plating baths. GN (7a)

The Adjustment of Sulphate Content in Chromium Baths. (Die Richtigstellung des Sulfatgehaltes in Chrombädern.) E. RAUB. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle*, Vol. 6, Aug., Sept. 1932, pages 41-50; *Oberflächentechnik*, Vol. 9, Oct. 18, 1932, pages 209-212. Cr plating bath should have proper acidity; best content of H_2SO_4 of chromic acid has been found to be 0.5-0.7%. Overacidity which often occurs, can be adjusted by additions of either barium carbonate, barium oxide or barium hydroxide which cause excess of H_2SO_4 to be precipitated as Ba_2SO_4. If barium hydroxide in solid form is used bath is preferably heated to about 60° C.; if it is added in solution heating is not necessary. Barium carbonate is best to use, as strong gas evolution causes thorough mixing. Ha (7a)

METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Embrittlement of Hot-Galvanized Structural Steel. SAMUEL EPSTEIN. *Proceedings American Society for Testing Materials,* Vol. 32, Part II, 1932, pages 293-374; discussion 375-379. This investigation was sponsored by Utilities Research Commission and Subcommittee X of A. S. T. M. and was carried out at Battelle Memorial Institute. Problem investigated was that of embrittlement in galvanized structural steel angles for electrical transmission towers. Data were collected from a large number of tests on 170 heats of Bessemer, duplex and open-hearth steel in the as rolled, pickled, and galvanized conditions, with punched and drilled holes. Testing method adopted was "angle bend test" (bending about a hole) and "hole tension test" (using a longitudinal specimen with a hole in it about 1/3 width of specimen). It was found that in commercial structural steel embrittlement is confined almost solely to largest size punched angles. Punching is principal factor in embrittlement. Pickling, galvanizing, nature of steel (in case of commercial steel conforming to A. S. T. M. Specifications A 7-29), and temperature of testing, play secondary, minor, or negligible roles. Recommendations were incorporated in a Tentative Standard "Guide for Avoiding Embrittlement." VVK (8)

Tentative Recommended Practice for Safeguarding Against Embrittlement of Hot-Galvanized Structural Steel Products and Procedure for Detecting Embrittlement. A.S.T.M. Designation: A 143-32T. *Proceedings American Society for Testing Materials,* Vol. 32, Part I, 1932, pages 615-618. By embrittled galvanized steel is meant material which has lost its ductile properties. Embrittlement may be complete or partial and seldom manifests itself except at points which have been cold worked, e.g., by punching. Any form of cold working reduces ductility of rolled steel. Bessemer steel in smaller sections, from 1/8" to 5/16" thickness, may not be susceptible to serious embrittlement. Open-hearth steel in smaller sections is not affected from a practical point of view. Intermediate size sections of open-hearth steel up to 11/16" thickness are seldom materially affected; and while heavier sections 3/4" and over, tend to be susceptible to embrittlement they are not always seriously affected. Pickling roughens surface and, therefore, has some effect in reducing ductility, but its major effect is a result of H absorption. Aging in service or heating to 300° F. brings about complete recovery from effect of H. Galvanizing is not injurious unless material has previously received severe localized cold working. Cold worked material should be annealed or stress-relieved. Smaller shapes, including thickness up to 1/4" may be cold worked by punching without subsequent annealing or stress-relieving. Shapes 5/16" to 11/16" thickness are not seriously affected as to serviceability by cold working in punching if punching is done under good shop practice. Heavier shapes, 3/4" and over, should be reamed after punching, or be drilled. Details of galvanized angle test are given. This Tentative Standard together with report by S. Epstein, "Embrittlement of Hot-Galvanized Structural Steel," comprising 109 pages, are bound separately and may be obtained from the American Society for Testing Materials for $1.00. VVK (8)

The Testing of Metallic Coatings. C. W. BORGMANN. *Metal Industry,* London, Vol. 42, Jan. 20, 1933, pages 107-109. Shop inspecting methods for the control of the products are discussed generally. Factors determining life of a metallic coating are properties of base metal, properties of coating metal, and mutual effects of 2 metals. Effect of internal stresses in certain coatings, i.e. electrodeposits, can seriously influence life of a coating, and tests by microscope or X-rays, should be made to ascertain their existence. Influence of environment, as atmosphere, may have an influence on mutual effects of base and coating and must be determined; this is of particular importance where coatings are produced by hot-dipping methods. Ha (8)

The Determination of the Porosity of Tin Coatings on Steel. D. J. MACNAUGHTAN, S. G. CLARKE & J. C. PRYTHERCH. *Sheet Metal Industries,* Vol. 6, June 1932, pages 75-81. Paper before May meeting of Iron & Steel Institute. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 300. AWM (8)

The Metallic Diffusion into Iron in the Solid State from Sprayed on Layers (Ueber die metallische Diffusion in Eisen in festen Zustand aus aufgespritzten Schichten.) P. BARDENHEUER & RICH. MUELLER. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 20, 1932, pages 295-305. Cementation of iron was investigated with different metals and alloys which were sprayed on to surface in form of powder of Ni, Cr, mixtures of Cr and Ni, Cr and Al, Ni and Al, Ni and Si, and of alloys of Cr and Si, Cr and Ni, Cr, Ni and Al, and Cr and Al. Ni diffused very badly, Cr however very well. Mixtures of Cr and Ni as well as Ni and Si gave good results; presence of Al has a retarding influence on diffusion of other metals although Al itself diffuses very quickly but only to very small contents. Alloys and mixture behaved similarly. All experiments showed a harmful influence of the oxides which entered the layer during spraying, this was particularly noticeable in the difference of the behavior of Cr and Ni when they were applied individually or as a powdered mixture because of their different affinity to the O in the inclusions. The observations made in the tests permit the conclusion that the gaseous phase plays an important part in every metallic diffusion in the solid state, as a diffusion between solid metals can take place only over the gaseous phase. Charts and micrographs illustrate the tests. 28 references. Ha (8)

The Alumilite Process for Decorating and Protecting Aluminum Products. H. BENGSTON & R. E. PETTIT. *American Machinist,* Vol. 77, Feb. 1, 1933, pages 76-79. The Alumilite process is a method for anodic coating of the specially prepared surface with H_2SO_4 and carried out in a tank with lead lining as the cathode, the piece being immersed as the anode; the operating voltage is 12 to 15 volts at a current density between 8 and 14 amp./ft.^{2} and a temperature of 70°-90° F. Time of treatment depends on required thickness of coating. Coatings can be left plain oxidized or colored with organic or inorganic colors, or lacquered, etc. The dielectric constant of the 0.002" coating is 8. Ha (8)

How the Steel Industry uses Hard Facing. W. A. WISSLER. *Paper presented at the International Acetylene Association,* Philadelphia, Nov. 1932, 4 pages. "Hard facing" is the process of applying a coat or edge of a highly wear-resisting metal to parts subject to wear, by welding; this process is entirely different from Cr-plating or case hardening as a different material is laid on the base material. Examples are given how much the life of machinery can be extended by this process; it finds particular use in the manufacture of hand shovels, ash cans, rolling mill and wire drawing equipment, etc. Ha (8)

New Metal Coating Process. (Ein neues Metallisierungsverfahren.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Mar. 5, 1933, pages 142-143. Brief mention of a new coating process developed by the Vienna chemist Ow, adaptable to coating all kinds of materials, as metals, wood, paper, inorganic products, etc. The new method is known as "Pangalvan" method. GN (8)

Nickel-clad Steel. *Mechanical World & Engineering Record,* Vol. 42, Dec. 9, 1932, pages 560-562. In many processes, vessels are required which must be strong and corrosion-resistant. Ni is highly resistant to corrosion but is expensive. Steel plates are strong and cheap. Fortunately Ni and Fe are mutually soluble in all proportions so that steel plates can be covered with Ni and a true bond between the 2 is secured. Thickness of Ni can be varied. A commonly used example is ¼" plate with a 10% covering. In fabrication, cold operations such as bending and flanging can be carried out in exactly the same way as with steel plates. Kz (8)

INDUSTRIAL USES & APPLICATIONS (9)

Use of Steel Castings in Welded Structure. J. G. RITTER. *Iron Age,* Vol. 129, Feb. 11, 1932, pages 396-398; *Machinery,* Vol. 38, Apr. 1932, pages 614-616. Abstract of paper read before Steel Founders' Society of America. See *Metals & Alloys,* Vol. 3, Oct. 1932, page MA 300. VSP + RHP (9)

Shape of Welded Bodies. (Gestaltung geschweissster Körper.) JOHN BRAUNFISCH. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Sept. 24, 1932, pages 931-934. It is demonstrated by several examples how shape of a body depends on material of which it is made, that for instance, shape of a cast piece cannot be used immediately for a welded object. Peculiarities of material must be taken into consideration. To obtain least possible weight it might often be more advantageous for small articles to work them from the full material instead of welding them together from pieces. Ha (9)

Welded Pontoons in Hamburg Harbor. (Geschweisste Pontonanlagen im Hamburger Hafen.) P. BRANDS. *Bauingenieur,* Vol. 14, Feb. 17, 1933, pages 101-102. Reports on application of welded pontoons for jetties in Hamburg harbor. Such welded pontoons proved highly successful. GN (9)

The Importance of Weight Reduction. L. AITCHISON. *Railway Engineer,* Vol. 53, July 1932, pages 246-247. Advocates use of duralumin for roofs, floors, window frames, moldings, seats, furniture, baggage racks, door and window fittings, heating and electrical equipment, ventilators, tread-plates, rails, handles and panels. In the U.S.A. and Germany, weight savings on the order of 25% have been accomplished. If a bold policy were adopted, a saving of no less than 50% of dead weight might be made on rolling stock without prejudicing the factor of safety. WH (9)

Logical Development of Airships for Fast Ocean Transportation. KARL ARNSTEIN. *Metal Progress,* Vol. 22, Dec. 1932, pages 38-42. Attributes and natural field for airships are recounted. Interrelation of all forms of transportation is pointed out. Carrying large payloads over long distances, the airship's particular field is transocean flights. Airship development has speeded the study and use of the light metals, particularly duralumin. WLC (9)

This is the age of metals and alloys. Whether it is a tiny piece of some relatively rare metal for a radio tube or a huge alloy casting for an oil still. These abstracts will tell you what is going on.

Notes on the Copper-rich Alloys. H. C. ANSTEY. *Metallurgia,* Vol. 7, Feb. 1933, pages 117-118. Describes some commercial coppers and Cu-base alloys. JLG (9)

Welding and Heat-Treating Alloy Steel Locomotive Frames. W. A. NEWMAN & C. F. PASCOE. *Iron Age,* Vol. 129, Jan. 28, 1932, pages 284-285, 300; *Journal American Welding Society,* Vol. 11, May 1932, pages 32-33. Discusses the effects of welding methods on alloy steel locomotive frames and proper methods of heat treating necessary to bring out desired properties. VSP + TEJ (9)

Developments in Design of Passenger Cars. G. H. BAILEY. *Railway Engineer,* Vol. 53, July 1932, pages 248-249. Critical discussion on use of steel and Al. With reference to latter metal, high price, difficulties in manufacture of high tensile Al-alloys and narrow working range of temperatures are criticized. Author however sees great possibilities in electric welding of steel utilized for purpose discussed and contradicts objection regarding liability to corrosion against use of steel due to recent advances. WH (9)

Length of Rails as a Factor of Stability of Railway Tracks. (La Longueur des Rails Facteur de Stabilite des Voies Ferrees.) E. BATICLE. *Genie Civil,* Vol. 100, Apr. 2, 1932, pages 334-338. Creeping of rails in its relation to temperature and length of a rail is investigated analytically and danger to safety of this phenomenon discussed. Rail lengths of 30 m. (100 ft.) are recommended which would eliminate creeping according to tests made. Ha (9)

Steel Wash-Boards, a Remarkable Innovation in Building Construction. (Fussleisten aus Stahl, eine beachtenswerte Neuerung im Hausbau.) R. BATZ. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Mar. 5, 1933, pages 133-134. Wash-boards, developed by Klöckner Works, are either hot-rolled profiles or pressed profiles of sheet. Former receive an effective rust preventing coating, latter are generally hot galvanized. GN (9)

Why Aluminum? (Warum Aluminium?) E. ZURBRÜGG. *Schweizerische Technische Zeitschrift,* Vol. 30, Apr. 20, 1933, pages 213-214. Al owes its manifold application to a number of valuable properties which distinguish it from other metals. These properties are discussed, possibilities of application thus given are pointed out. GN (9)

Steel in the Mining Industry. (Stahl im Bergbau.) R. WÜRKER. *Montanistische Rundschau,* Vol. 25, Mar. 16, 1933, pages 5-7. Discusses manifold possibilities of application of steel. GN (9)

Music Wire Springs. I. V. WILLIAMS. *Bell Laboratories Record,* Vol. 11, Jan. 1933, pages 134-136. Steel wire as used in musical instruments combines extreme tensile strength with a high elasticity, high elastic limit and very great toughness to permit kinks without breaking. A wire of only 0.005" dia. can have a tensile strength of 700,000 lbs./in.^{2}. As this steel is easily susceptible of corrosion it is coated with Zn, Sn, or Ni with Cu. This material is now widely used also for little helical springs, e.g. in telephone apparatus. Ha (9)

Metallic Molds for Electrotyping. J. H. WINKLER. *Printing Equipment Engineer,* Vol. 45, Aug. 1932, pages 17-18. Progress made in developing metallic molds for electrotyping is discussed. Kz (9)

Metals in Ships. W. R. G. WHITING. *Metal Industry,* London, Vol. 42, Jan. 13, 1933, pages 31-34, 38. Non-ferrous metals, lavishly used for ornamental and mechanical purposes in the large luxurious vessels and to some unavoidable degree in cargo ships are reviewed. The largest single piece, usually of Mn bronze is the propeller. Figures of present large steamers are given. Ha (9)

Tubes Centrifugally Cast in Sand. (Sandzentrifugalguss-Muffenrohre der Halbergerhütte in Brebach a.d. Saar.) WAHL. *Gas und Wasserfach,* Vol. 76, Feb. 11, 1933, pages 97-98. Molding, casting, finishing, dimensions and a few tensile tests are described. GN (9)

Reconditioning Valve Seats in I. C. Road Engines. R. WAKE. *Mechanical World & Engineering Record,* Vol. 42, Sept. 23, 1932, pages 296-297. The only way to overcome the bad effects due to sunk valves is to fit readily renewable seats which remain gastight and free from slackness. Al bronze is a suitable material, but as it has a higher coefficient of expansion than cast iron, interference must be avoided while expansion is allowed for, tightness being maintained at the same time. This is obtained by interposing a ductile locking device. Chemical and physical properties of the Al bronze are given. Kz (9)

Steel Floor Slabs Made up of Preformed Sheets. *Steel,* Vol. 90, June 13, 1932, page 28. A description of a new type of steel floor slab developed for use in building and bridge construction. JN (9)

Steel Is Finding New Use In Smoke Washing Equipment. *Steel,* Vol. 90, June 20, 1932, pages 26, 28. Description of construction, operation and installation of a patented smoke washer for eliminating soot, dust and fly ash from chimney gases. JN (9)

Elektron Metal in European Bus and Trunk Construction. (Das Elektronmetall im europaischen Omnibus- und Lastwagenbau.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 30, 1933, pages 180-184; May 14, 1933, pages 202-204; June 4, 1933, pages 226-227. Considers European experiences in using this light metal alloy in the above mentioned field. GN (9)

Tin and Housing. *Tin,* Apr. 1933, pages 5-7. A general review of the uses of tin in its different forms entering the building of houses. Ha (9)

Tin in the Home. *Tin,* Jan. 1933, pages 17-18. Brief review of extensive uses of tin in household wares and toys. Ha (9)

Welding in South Africa. *Welder,* Vol. 4, Oct. 1932, pages 16-19. Examples of buildings, tanks, structures, etc., are illustrated and described. Ha (9)

Welded Machinery for the Textile Industries. *Welder,* Vol. 4, Oct. 1932, pages 22-23. A warp sizing and drying machine welded together of parts of mild steel is described. Ha (9)

The Heat Treatment and Manufacture of Small Automotive Steel Parts. E. F. Davis. *Fuels & Furnaces,* Vol. 10, Jan. 1932, pages 25-30, 38. Screws, studs, etc. of lesser importance in the automobile industry are made of cold-drawn, low C bars of rimmed (not deoxidized) steel. The various processes of manufacture, materials used and heat treatment employed are described briefly. Ha (9)

"Fista" Welded Steel Poles for Overhead Wires. *Welder,* Vol. 4, Oct. 1932, pages 24-26. Welded steel poles are stiff, light, sturdy and resistant against damp, rot, etc. They bend and do not break as do wood poles. Ha (9)

Alloy Steels, their Development and Application. J. W. Donaldson. *Metallurgia,* Vol. 7, Feb. 1933, pages 127-129. Brief discussion of structural steels, heat-resistant steels, and nitriding steels. JLG (9)

Aluminum-Steel Cables for Overhead Electrical Transmission Lines. (Les Cables en aluminium-acier pour les lignes aérinnes de transmission d' énergie électrique.) H. Carpentier. *Revue Générale de l'Électricité,* Vol. 32, Nov. 26, 1932, pages 691-694. Behavior of Al conductors with steel cores is investigated with respect to stresses occurring in 2 parts with changing temperature. Formulae for calculation of these stresses are developed and the best ratio for the section of Al to steel derived. A characteristic temperature is found for which the tension remains constant independent of span and where sag is same as that under most unfavorable overload. Span can vary from 150 to 600 m. Ha (9)

Pewter and Its Revival. H. H. Cotterell. *Tin,* Jan. 1933, pages 8-10. Art of making wares of pewter for ornamental and house purposes is reviewed; the slowness with which pewter (tin) assumes dullness and its esthetic appearance even in dull state and the ease with which it lends itself to artistic work are considered the greatest attraction and reasons for the reviving art. Ha (9)

The Trend of Progress in Aluminum. N. F. Budgen. *Metallurgia,* Vol. 7, Feb. 1933, pages 105-108. Describes applications of rolled and cast Al and Al alloys. Brief description of some new methods of treating Al and some new alloys. JLG (9)

Manufacture of Aluminum Foil. (Herstellung der Aluminiumfolien.) *Aluminium,* Vol. 14, Sept. 30, 1932, pages 2-4. The great many uses of Al foil, especially in packing industry, are pointed out and their advantages over Pb or Sn foils explained; one of the most important is the possibility of subjecting Al foils to an annealing process at high temperatures which the other metal foils will not stand so that all germs are killed and an absolutely hygienic material is obtained. While the thinnest Sn foil is 0.007 mm., Al foil can be made 0.005 mm. thick, which is 74 m.^{2}/kg. Al. The rolling of foil is briefly described. Ha (9)

Copper Roofs. (Les Toitures en Cuivre.) *Cuivre et Laiton,* Vol. 5, Sept. 15, 1932, pages 391-397; Oct. 15, 1932, pages 439-449. A complete manual for design and construction of Cu roofs with all details of different kinds of joining the Cu plates to each other and to walls, roofs and other parts of a building. Examples of small and also very large public buildings are illustrated showing the manner of making and designing the Cu roof. Ha (9)

Copper Roofs. (Les Toitures en Cuivre.) *Cuivre et Laiton,* Vol. 6, Jan. 15, 1933, pages 5-12. This last installment gives methods of calculation and laying out of required material for gutters, outlets, sinks, and fittings, and closes with a general review of economical advantages of Cu installations over Zn; a table is given showing comparative prices for these 2 kinds of roofing. Ha (9)

Metals for Crushing and Grinding Machines. *Crushing & Grinding,* Vol. 1, Nov.-Dec. 1932, pages 230-231. A review, with photomicrographs. AHE (9)

Some Notes on Coalcutter Picks. *Colliery Engineering,* Vol. 9, Aug. 1932, pages 292-293. In order to warrant satisfactory results, use of a steel alloy containing C, Si, Mn, Cr, and V is recommended for picks for chain and disc type machines, whereas carbon steel has to be used for pneumatic puncher type coal cutters to avoid fatigue failures. Kz (9)

Corrosion of Mains. *Colliery Engineering,* Vol. 9, Sept. 1932, pages 308-309. Preventive measures as wrapping, protective painting, galvanizing, calorizing and parkerizing against the rusting of mains are summarized. Kz (9)

All Metal Bus Bodies. *Electric Bus & Tram Journal,* Vol. 67, Oct. 14, 1932, pages 186-187. Pertains to demonstration of just one of advantages of all-metal bus construction, to ease of repair work on buses damaged in accidents. WH (9)

Welded Sheet Steel Roof Reduces Construction Costs. *Electrical Engineering,* Vol. 52, Jan. 1933, page 35. Roof slanting at an angle of 30-40° is supported only at top and bottom, sheets forming a catenary curve of 140 ft. length. 42 roofs of 288 ft. width of No. 12 gage mild steel sheets overlapping 2" were made. Method of welding and erection are described. Ha (9)

A. T. V. Turbine Blading. *Engineering,* Vol. 135, Mar. 10, 1933, pages 289-292. The Normandie, a new Atlantic liner has been equipped with turbines bladed with ATV steel, 66 tons of this expensive material being used in the fixed and moving blades. Illustrations show effect of service on blades made of ATV steel, 5% Ni steel, and of Cr steel. ATV steel is especially suitable for marine service because of its immunity against corrosion and also because its coefficient of expansion is very close to that of the Ni steel of the discs preventing differential expansion between the blades and the disc. ATV steel can also be successfully used under high pressures and high temperatures. LFM (9)

High-Chromium Steel Economical in Rabble Arms. *Engineering & Mining Journal,* Vol. 134, Jan. 1933, page 39. Ni-steel containing 27-30% Cr and 2-3% Ni and a maximum of .15% C is specified for all rabble arms and teeth, and a straight 15% Cr-steel for lute rings and hearth rings in roasting furnaces engaged in roasting Pb and Zn ores. WHB (9)

Aluminum Castings Used in New Diesel Engine. *Foundry,* Vol. 60, Aug. 1932, pages 22-23, 49. The engine is extremely compact and is constructed altogether of Al alloys with the exception of Fe cylinder sleeves, Cr-Ni crank-shafts and nitrided steel plungers from No. 355-T5 alloys, an Al alloy containing 5% Si and subsequently heat treated. After cleaning the castings they were subjected to pressure tests. Each chamber was tested with air or water at pressure of 60 to 90 lbs./in.^{2}. Describes operation of the engine. VSP (9)

Largest Centrifugally-Cast Bronze Wheel Ever Made. *Foundry Trade Journal,* Vol. 47, Dec. 15, 1932, page 362. Description of a large centrifugally-cast bronze wheel weighing 2,016 lb. Physical properties of the metal are given. OWE (9)

Nickel Cast Iron in Diesel Engines. *Foundry Trade Journal,* Vol. 47, Oct. 6, 1932, pages 206-208. Extracted from Publication B.10 of the "Bureau of Information on Nickel." Various grades of Ni cast iron are used in recent developments in Diesel engine design, in particular for cylinder liners, heads and breach ends, for pistons, piston-rings, valve sleeves and exhaust manifolds. The article contains several photographs of Diesel engine parts of Ni cast iron. OWE (9)

Stainless Steel Tube Making. *Indian Engineering,* Vol. 92, Oct. 15, 1932, page 312. Some data on Cr and Cr-Ni steels are given and brief reference is made to fatigue resistant Cr-Mo steels. WH (9)

Irving Steel Road Armouring and Bridge Decking. *Iron & Steel of Canada,* Vol. 16, Feb. 1933, pages 29-30. Description of some of main advances in design of steel armoured road surfaces, especially applied to bridge decking. OWE (9)

Steel and Concrete Water Supply Tunnel in Vancouver. *Iron & Steel of Canada,* Vol. 15, Oct. 1932, pages 126-127. Description of installation under Burrard Inlet. OWE (9)

New Outlet for Rolled Steel Products. *Iron & Steel of Canada,* Vol. 15, Sept. 1932, page 111. Use of steel cylinder reinforced concrete pressure pipe for water supply systems is illustrated. OWE (9)

Beauharnois Power Plant. *Iron & Steel of Canada,* Vol. 15, Oct. 1932, pages 119-121. Description of this power development, first stage being now complete. OWE (9)

Notes on the Use of Steel Props. *Iron & Coal Trades Review,* Vol. 125, Sept. 30, 1932, pages 495-496. According to experiences gathered in a British coal mine, advantages of steel props over usual wooden props were said to be as follows: able to control roof, easy to withdraw, no broken props, working advantages for the men by not having to attend to repairs before starting work, output was increased 6 to 8%, no large roof breaks, cost of lost steel supports was only 0.075 d/ton. The weight of a steel prop is 9 lbs./ft.; a wooden prop weighs 36 lbs. Ha (9)

Weldless Steel Chains, Their Manufacture and Characteristics. *Iron & Coal Trades Review,* Vol. 126, Feb. 10, 1933, page 221. Weldless steel chains are made from cruciform bars; a long length of chain is produced directly from a bar of special section which is passed through a rolling mill to form the links which are then finished by special machines. The different steps of the process are described more in detail. The advantages of weldless steel chains are said to be: (1) half the weight for equal strength of welded iron, (2) the ends of the links are thickened to provide for wear so that they have a much longer life than ordinary welded chains, (3) full strength of the material is obtained, no reduction on account of welding need be made, (4) higher margin of safety (28 to 32 tons/in.^{2} tensile strength). Ha (9)

A Study of Partial Denture Construction by the Pasadena Prosthetic Study Club. *Journal American Dental Association,* Vol. 20, Apr. 1933, pages 598-614. Recommends gas and compressed air as safest combination to avoid overheating gold in melting for casting. Other combinations which may be used are acetylene and air, oxygen, and gas. The golds best suited for partial dentures are exceedingly hard with high yield point and high tensile strength, which should be heated to a dull red heat and quenched in water to insure toughness. OEH (9)

All-Welded Steel Tie Made By Delaware & Hudson. Bernard C. Tracey. *Iron Age,* Vol. 130, Nov. 10, 1932, pages 722-723, adv. page 20. Ties as manufactured by the Delaware & Hudson R.R. consist of 2 lengths of used rails laid with their bases butting together and fastened by means of standard tie plates welded in place. Rails are held in place on ties by clamps, which in turn are held by spring keys. Cost of production is under $4.00 a tie. Describes method of welding. VSP (9)

Steel Road Bridges of Small Span. E. Taylor. *Structural Engineer,* Vol. 20, Sept. 1932, pages 382-392. The subject, which has been viewed from the experience acquired principally in the past 10 years in building 50 or 60 bridges of up to 120 ft. span, is discussed under the following headings: progress in steel manufacture, modern trend in bridge manufacture, bearings, flooring, painting, corrosion allowance, erection, riveting, plate girders, relative costs of reinforced concrete and steel bridges, suggestions as to the best type of bridges. WH (9)

Impending Developments in Shipbuilding. E. P. Trask. *Marine Engineering & Shipping Age,* Vol. 37, June 1932, pages 243-244, 254. Growing size of merchant vessels and the demand for lightness in naval vessels gave rise to the use of special high-tensile steel besides mild steel. Attention has been directed to high elastic limit, rather than ultimate strength alone. Increase in demand should bring the price more in line with ordinary ship steel. Recent development is the use of Al alloys for bulkheads and casings in naval vessels. High-grade steels in connection with welding reduce weight 15 or 20%. Inner bottom and double-bottom framing are more subject to corrosion and made thicker. Stainless steel and protective coating may bring savings in weight. Two examples are given of what may ultimately be expected after study of the proposed materials and methods. Reduction in weight of the hull structure 11.5 and 13%, in power and fuel 8%. Pay load increases. Kz (9)

Action of Metallic Copper on Germs in Drinking Water (Action du Cuivre Metallique sur les Germes des Eaux d'Alimentation). Pilod & Codvelle. *Cuivre et Laiton,* Vol. 6, Jan. 15, 1933, page 22. Cu develops within 4 days germicide action at 18° C., 6 days at 0° C., and 60 hours at 50° C. Germicide action on different bacilli is described. Ha (9)

Advantage of Metal Base. M. H. Lindberg. *Printing Equipment Engineer,* Vol. 45, Nov. 1932, page 16. Summary of advantages of metal bases compared with wooden blocks in printing practice. Kz (9)

Colliery Winding Ropes: Their Design and Construction. Henry D. L. Lloyd. *Proceedings South Wales Institute of Engineers,* Vol. 48, Jan. 17, 1933, pages 445-481. Microstructure of rope wire is discussed and photomicrographs of satisfactory and unsatisfactory wire are given. Design of ropes is discussed at length with extensive data on elongation with varying loads for various ropes. AHE (9)

Iron Forms for Concrete Structures. (Eiserne Betonschalungen.) Otto Luchterhand. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Apr. 16, 1933, pages 221-222. New type of concrete form is described being an improvement over wooden ones in that they have a higher durability and are cheaper in handling. Special Cu bearing steel plates are used. Advantages: Lower weight and easy handling as compared with wood forms. Method is patented by author and marketed by the Internationale Baumaschinenfabrik, Neustadt a.d. Haardt. GN (9)

Economies of Welded Pipe. Frank Lane. *Welding Engineer,* Vol. 17, Oct. 1932, page 41. Advantages of welded pipe joints over screwed joints are set forth, consisting mainly in increased efficiency, higher strength factors, longer life; these factors counterbalance higher cost of installation. Economies obtained in large pipe installations are demonstrated by a few examples. Ha (9)

Aluminum and Carriage Design. G. W. Lacey. *Railway Engineer,* Vol. 53, July 1932, pages 247-248. The use of Al and its alloys in rolled, wrought, forged and cast state with reference to reliable construction is discussed. Every reduction effected in weight of a part makes possible a certain further reduction in weight because the total stress contributed by the weight of the vehicle has been lessened. The problem is tackled from the viewpoint of the designing engineer. Data on properties of Al are presented. WH (9)

Combining Die Castings with Stampings. L. H. Morin. *Iron Age,* Vol. 129, Jan. 28, 1932, pages 286-287. Combination of die casting and stamping opens up a field with unusual possibilities. Uses of die castings and stampings are numerous. Describes some of the applications. VSP (9)

Correct Grade Selection Emphasized at Stainless Steel Symposium. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 68, May 6, 1933, pages 552-553, 561. Discussion of use of stainless steels in automotive industry. Careful study of limiting requirements of individual application will help to specify proper type of material for elevated temperature, corrosion resistance, decorative effect or structural properties. One of the recent developments is use of 18-8 strip in rolled forms and sections, as pioneered by Budd for the railcar and truck bodies. This material has tensile strength of about 175,000 lbs./in.^{2} after cold working. DTR (9)

1932 Stimulated Ingenuity of Machine Tool Designers, Introduced New Materials. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 68, Jan. 21, 1933, pages 71-72, 80. Discussion of progress in automotive manufacture for the year 1932. Points to improved manufacturing equipment, new and improved processes, and introduction of new or improved engineering materials. Practically every new phase in design, construction, materials, and finish is itemized in complete summary fashion. DTR (9)

Nitrided Steel Used for Many Machine Parts. Correspondence from F. GIOLITTI. *Metal Progress*, Vol. 22, Aug. 1932, pages 51-52. Rapid development of uses for nitrided steel in mechanical construction in Italy is discussed. WLC (9)

Steel Construction, Section and Outline. (Stahlbau, Querschnitt und Umriss.) H. GOTTFELDT. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Sept. 17, 1932, pages 901-907. The most important problems and progress made in steel structures, the determining factors for safety at different loads and particularly the present state of behavior under compression, vibrating and torsional stresses are reviewed. Methods for measuring stresses on finished structures are discussed and the use of welding and cutting methods investigated. 70 references. Ha (9)

A Welded Vessel for Highly Concentrated Alkalies. (Ein geschweisster Behalter für hochkonzentrierte Lauge.) F. GREGOR. *Apparatebau*, Vol. 45, Mar. 17, 1933, pages 28-30. Summarizes present knowledge on caustic brittleness. Proper application of autogenous welding seems to be a suitable means to avoid caustic brittleness. GN (9)

Aluminum Castings in Rolling-Stock. W. H. GRIEVE. *Railway Engineer*, Vol. 53, July 1932, page 247. Foundry and physical properties of "modified Al-Si alloys" allow large and intricate parts to be cast in one piece. 10 years ago, sliding doors, light frames and louvres, and window moldings for frameless types of drop lights were introduced in Great Britain. Advantages are fully dealt with and further applications touched upon are interior fittings, including lamp and luggage brackets, grab handles, ventilator grids, electric switch and junction boxes, door sill plates and roof cappings. In construction of seats, castings are used for ends, frames and pedestals, both fixed and rocking type. Carlines cast in one piece have been very successfully used in roof construction. WH (9)

Forged and Alloy Malleable Iron for Special Uses. FRED B. EGAN. *Iron Age*, Vol. 129, Mar. 24, 1932, pages 728-729. Ease of forging of malleable Fe brings up possibilities of casting intricate castings and finishing by forging. Alloy malleable when molten, is more fluid than steel and can be cast into any desired shape. Gives short time tests showing comparison of corrosion-resisting properties of alloy malleable, alloy gray Fe and alloy steel in acid, all containing equal amounts of the same alloys. VSP (9)

Aluminum Radiators, the New Heating Equipment for Central Heating Installations. (Aluminium-Konvektoren-die neuen Heizkörper für Zentralheizungen.) A. EIGENMANN. *Schweizerische Technische Zeitschrift*, Vol. 30, Apr. 27, 1933, pages 245-249. After briefly discussing properties, advantages and disadvantages of various former types of common radiators, the properties of a new Al built radiator recently built in Switzerland are described in detail. GN (9)

Metals Used in Chemical Industrial Plants. CHAS. J. ELLIOTT. *Metal Industry*, London, Vol. 41, Nov. 25, 1932, pages 511-513; Dec. 9, 1932, page 562. General properties of Cu alloys, bronzes, Ni and some special alloys are described, field of application and composition given. Ha (9)

Heat Insulation. LINDSAY FOSTER. *Steam Engineer*, Vol. 2, Mar. 1933, pages 260-262. The use of "Glass Silk" and "Alfol" for heat insulation is discussed. "Alfol" is Al foil. "Glass Silk" is essentially glass wool. AHE (9)

A Contribution Towards the Use of Steel Underground. A. H. T. CRAWSON. *Iron & Coal Trades Review*, Vol. 125, Dec. 9, 1932, page 893; Dec. 16, 1932, pages 926-930. Experiences made over 6 years in use of steel arches in support of roads and 4 years use of steel props and bars and roof supports have conclusively proved that the substitution of steel for wood in mine work is economical, efficient and safe. Types of steels used and manner of applying are described and illustrated. Ha (9)

Use of Light Metals in Salt Works. (Die Verwendung von Leichtmetall in den Salinenbetrieben.) ERWIN SIEGMUND. *Metallwirtschaft*, Vol. 12, Feb. 17, 1933, pages 91-92. Light metals do not corrode or become dirty in contact with salt solutions and they contain no injurious impurities. Pure Al and especially the alloy "KS-Seewasser" containing 1.4% Mn, 2% Mg, .2% Sb and .7% Si have been used in several salt works for elevator buckets and other parts. They have replaced stainless steel on account of lower cost and porcelain because it chips. They have been in service for several years and have given very good service. KS-Seewasser alloy is used both in the cast and wrought form. CEM (9)

Electric Welding in Oil Tankers. E. F. SPANNER. *Welder*, Vol. 4, Oct. 1932, pages 6-11. Application of welding to castellated stiffeners in an oil tanker results in a saving of 25 to 30% in weight, part of which would be taken up again in the added thickness of the shell and bulkhead plating. Constructive details are illustrated. Ha (9)

Rails of Compound Steel for Railroads and Tramways. (Schienen aus Verbundstahl für Vollbahnen und Strassenbahnen.) R. SPIES. *Glasers Annalen*, Vol. 112, Mar. 15, 1933, pages 48-52. The increase in recent years of train speed, train weight and permissible axle pressure caused an increased wear of the rails, thus necessitating an improvement of the rails. Hard rail surface in conjunction with a softer web and foot are required. For this reason the so-called compound rails were developed having the mentioned properties. The paper outlines some methods of processing such rails. Data on the results of impact, torsion and welding tests are given. GN (9)

Steel Carriage and Wagon Springs. C. E. SQUIRE. *Railway Engineer*, Vol. 53, July 1932, page 250. For coil springs the plain C oil-hardening steel still seems to yield the best general service although it must be noted that a water-hardening Si-Mn steel for both laminated and coil springs is being used successfully on the German State Railways. WH (9)

Bearing Metals as Made and Used Today. C. H. BIERBAUM. *Iron Age*, Vol. 129, Mar. 31, 1932, pages 774-776, 817. A comprehensive review presented at the Conference on Metals and Alloys in Cleveland. See *Metals & Alloys*, Vol. 3, July 1932, page MA 214. VSP (9)

Special Quality Steels for Shipbuilding. WILLIAM BENNETT. *Iron Age*, Vol. 129, Mar. 3, 1932, page 551, adv. sec. page 28. See *Metals & Alloys*, Vol. 3, July 1932, page MA 214. VSP (9)

Alloy Cast Irons in Automobile Construction. A. B. EVEREST. *Foundry Trade Journal*, Vol. 48, Feb. 16, 1933, pages 127-128; Feb. 23, 1933, pages 135-136; *Machinery*, London, Vol. 41, Feb. 9, 1933, pages 567-568. The alloy cast irons of most importance are those containing Ni which gives a more homogeneous product with less porosity and leakage. Conclusions regarding the wear of cylinder liners are not definite. The heat-treatment of cast Fe liners must be modified when alloy cast irons are in question. The improved wearing qualities of alloy cast irons in the martensitic, pearlitic and austenitic form are now available. Kz + OWE (9)

A Proposed 800-Foot Atlantic Liner. E. P. TRASK. *Marine Engineering & Shipping Age*, Vol. 37, July 1932, pages 268-275; discussion Oct. 1932, page 447. To compete with German liners an American steamer is proposed and discussed. Factors of greatest importance are means of weight saving. (1) Adoption of Cromansil, Ni or equal "super-steel" for main strength members of the hull. (2) Stainless steel or protective coated steel where extra thickness is needed against loss from corrosion. (3) Extensive use of welding. (4) The use of Al alloy for various constructions as bulkheads, etc. (5) Substitution of Al alloy for wood, furniture, etc. (6) Use of Al foil insulation of engine, boiler, refrigerator rooms, etc. (7) General use of Al paint. Physical properties of 6 specimens of Cromansil steel, which is proposed for the hull, are given. The steel contains: 0.20 and 0.30% C; 1.35% Mn; 0.47% Cr; 0.89% Si; 0.056% S, and 0.020% P. Further tests were carried out with Ni steel containing 0.21% C; 0.82% Mn; 0.24% Si; 2.71% Ni; 0.042% P, and 0.022% S. Kz (9)

Steel Brake Drums Lined with Cast Iron. (Tambours de Friens en Acier Doubles de Fonte Centrifuge.) TRY-CHALONS. *Revue de Fonderie Moderne*, Vol. 26, Oct. 10, 1932, pages 376-378. Steel brake drums are lined with centrifugally cast Fe. Foundry equipment is described. Ha (9)

Aluminum in Ship Building. (Aluminium im Schiffbau.) P. URECH. *Schweizerische Technische Zeitschrift*, Vol. 30, Apr. 20, 1933, page 230-233. Description of a Swiss motor ship built of Al. The use of Al in building warships is touched upon. GN (9)

Miss England III's Engines—Forging and Heat-treating the Steel Parts. J. W. URQUHART. *Mechanical World & Engineering Record*, Vol. 92, Aug. 12, 1932, pages 152-155. Description of forging plant. Forging temperature for the various components was 1100° C. The crankshafts are of oil-hardening Ni-Cr steel containing: 0.35-0.42% C; 0.30% Si; 0.45-0.65% Mn; 0.05% S and P; 1.25-1.75% Ni; 0.75-1.25% Cr. Tensile strength = 100 tons/in.^{2}; Brinell hardness = 144, rolled = 228. Heat-treated: quenched (oil), from 850° C. tempered down to 250° C. Cams and camshafts are of casehardening steel containing: 0.20% C; 0.30% Si; 0.40-1.00% Mn; 0.07% S and P. Treatment: Forge at 1000°-1100° C. Carburize at 950° C. for 6-8 hours; cool in box; reheat to 750°-775° C., and quench in oil or water for heavy parts. Connecting rods are made from Ni-Cr steel (3.50% Ni, 0.75% Cr). All machining on timing gears is carried out before heat treatment and after annealing. Gudgeon pins are made from 2% Ni casehardening steel. For valves a Si-Cr steel is used. Composition: 0.40-0.50% C; 3.50-4.25% Si; 0.40-0.60% Mn; 0.03% S and P; 0.05% Ni; 7.50-8.50% Cr. Brinell hardness = 255-286. Quenched in oil from 950° C. to 650°-700° C. cooling out in water. For valve tappet and power transmission parts a 5% casehardening Ni steel was used, but Ni-Cr steel is employed for these purposes today to avoid deformations by heat treatments. Pinions are made from the 2% case hardened Ni steel or Ni-Cr cold hardening steel. Kz (9)

Metal Finishing of Electric Irons. CLARENCE L. VANDERAU. *Metals & Alloys*, Vol. 3, 1932, pages 264-209. Describes modern methods of grinding, polishing, and plating as they apply in the production of the household iron. WLC (9)

Copper Vats for Fat Decomposition. (Kupferne Bottiche für die Fettspaltung.) R. HEUBLUM. *Metallwirtschaft*, Vol. 12, Mar. 3, 1933, pages 121-122. Wooden and Pb coated steel vats have not been entirely satisfactory for continuous operation of the Twitchell process for fat decomposition. To test the suitability of Cu for this purpose the loss in weight of Cu strips .71 mm. thick was determined when immersed in boiling solutions of 1% H_2SO_4 and a mixture of 100 g. oil, 50 g. H_2O, 0.5 g. H_2SO_4 and 1 g. decomposition reagent. The loss in 1% H_2SO_4 was .00038 g./cm.^{2} during the first day and .00214 g. in the 10 days together. In the mixture the loss in weight also slowed up after the first day, probably due to the formation of a protective coating. In further tests it was found that Cu had no effect on the yield of fatty acids. A 5 mm. thick Cu sheet hung in a production vat for 4 months lost .5% of its weight. As a result of these tests Cu was used in the construction of vats in a soap factory in Krasnodar, Russia, in 1929 and the vats have operated satisfactorily since. CEM (9)

Aluminum Booms and Buckets on Mississippi Levees. DOUGLAS B. HOBBS. *Engineering News-Record*, Vol. 110, Feb. 9, 1933, pages 192-194. Levee-building practice has swung notably to the use of Al-alloy booms and buckets for draglines. The saving in weight over steel booms is utilized by increasing the length by 15 to 20% and increasing the capacity of the bucket by 20 to 25%. CBJ (9)

Construction and Manufacture of Steel Wire Rope. G. C. HODGSON. *Transactions Canadian Institute of Mining & Metallurgy*, 1932, pages 258-267. Discussion. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA114. AHE (9)

Magnesium Takes Its Place As A Structural Material. JOHN A. GANN. *Iron Age*, Vol. 129, Apr. 14, 1932, pages 372-373. Mg metal is used commercially in pyrotechnics, chemicals, deoxidizers, alloys and structural materials. Addition of approx. 0.1% Mg to Ni and Ni alloys makes these metals sufficiently malleable to permit fabrication. Its efficiency depends on the strong electromotive character of the metal and its great affinity for O at high temperatures. The future wide adoption of Mg in industrial life depends on: (1) Ready availability of sufficient raw materials; (2) Development of efficient manufacturing processes yielding a low cost metal; (3) Development of methods of casting, working and treating the metal; and (4) Development of alloys of proved dependability. VSP (9)

The Use of Light-Weight Magnesium Alloys. JOHN A. GANN. *Machinery*, Vol. 38, Apr. 1932, pages 568-569. Briefly reviews development of commercial Mg base alloys having a specific gravity of less than ¼ that of steel. Used wherever lightness combined with strength and toughness are required. Suggests many uses. Treats briefly of casting, heat-treatment, hot and cold working, welding and riveting of Mg alloys but with special reference to "Dowmetals." RHP (9)

Body Styles Displayed at New York Show Offer An Interesting Study in Trends. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 68, Jan. 28, 1933, pages 96-99. Inclined radiator fronts, sloping windshields, deeper fenders with front and rear skirts, more careful attention to the fairing of sheet metal joints appear to be the general trends. Zinc has become an almost universal medium for expressing design in ornament, body hardware, and bright plated or enameled attachments. Improvements in body and sheet metal technique are evident at every turn. DTR (9)

Non-Ferrous Metals in Railway Engineering. BRIAN REED. *Metal Industry*, London, Vol. 42, Jan. 13, 1933, pages 35-38. Use of Cu and Al and their alloys in railway construction is reviewed. Cu with 0.5% As is used for fire boxes, recently 0.5% Ag has been introduced which raises considerably the softening temperature but increases the hardness. Ni-Cu stays are used extensively, bronze for bearings, for a variety of which a table is given, as also for Al alloys with their physical properties. Ha (9)

United States Navy Uses Anchor Chain Made of Steel Castings. GEORGE H. ROCK. *Foundry*, Vol. 60, Apr. 1932, pages 46, 80. Until recently wrought Fe chain was used on naval vessels although not always satisfactory. General Electric Co. developed a cast Fe chain which had ductility approximating that of wrought Fe and with considerable higher ultimate strength. National Malleable & Steel Casting Co. also made cast Fe chain similar to that used for car coupler knuckles. Navy tests showed superiority over wrought Fe chain in uniformity in dimensions and homogeneity of material. VSP (9)

All-Welded Cotton Seed Storage Tanks. M. L. ROGERS. *Welding Engineer*, Vol. 18, Jan. 1933, pages 30-31. Details of design and construction of ventilated tanks of 80 ft. diam. and 60 ft. height for storing cotton seed are given; 150 tons of steel were used per tank. Ha (9)

Curie Point of Ferro-Cerium (Point de Curie du Ferro-Cerium). G. RASSAT. *L'Industric Electrique*, Vol. 41, Nov. 10, 1932, page 496. See *Metals & Alloys*, Vol. 3, Oct. 1932, page MA 290. Ha (9)

Welded Ships. A. T. Wall. *Welder*, Vol. 4, Oct. 1932, pages 3-6. Author emphasizes that in taking advantage of all factors in welding of ships the design itself should be properly adapted to the new method, new types of ships being quite likely to be developed as the deadweight is smaller in an all-welded ship than in a riveted ship. A greater cargo capacity will result. Ha (9)

Nickel Cast Iron in Diesel Engines. *Marine Engineering & Shipping Age*, Vol. 37, Sept. 1932, pages 391-392. Materials used for cylinder heads, cylinder liners, pistons and piston rings of Diesel engines require the following properties: (1) strength at elevated temperatures, (2) elimination of porosity, (3) maximum resistance to wear, (4) minimum growth due to repeated heating. Temperatures vary from room temperature to 630° F. and may quickly reach 900°-1000° F. in case of disarrangements of cooling systems. Pressures of 600-2500 lbs./in.^{2} are encountered in working cylinders and air-compressor cylinders. Influence of Ni additions on gray cast iron is discussed. Increase in hardness and good machineability. The Si content is reduced. Ni iron castings have a finer structure and are free from hard and brittle iron-carbide particles which become dislodged by friction and act as an abrasive when Ni-free cast irons are used. Kz (9)

Italian-built Destroyers for Greece. *Marine Engineer & Motorship Builder*, Vol. 55, Aug. 1932, page 285. In the interest of lightness liberal use has been made of high-tensile steel in the construction of the vessels, while Al alloy has been used in the bridge construction and electric welding has replaced riveting in many places. Kz (9)

Processing Lead and Tin Foil for Capsules. (Herstellung von Blei- und Zinnfolien zur Kapselfabrikation.) *Maschinenkonstrukteur-Betriebstechnik*, Vol. 66, Mar. 4, 1933, pages 35-36. Considers composition and fabrication of Pb and Sn foil for the above mentioned purpose. GN (9)

Wire Mining Ropes. *Mechanical Handling & Works Equipment*, Vol. 20, Mar. 1933, pages 91-92. The lay up and uses of the principal types of wire ropes used in mining are briefly described. JCC (9)

Aluminum and the Car. *Metal Industry*, London, Vol. 41, Oct. 1932, page 400. Necessity for and advantages of light metals in automobile industry are briefly explained. Pure Al is an excellent material for manufacture of intricate shapes, while for parts of greater strength Al alloys are employed. Several examples are illustrated. Ha (9)

Metals in Modern Shop Fronts. *Metal Industry*, London, Vol. 41, Dec. 23, 1932, pages 607-608. Several examples of artistic and ornamental use of shop window frames, display fittings, etc., in stainless steel, Monel metal, silveroid and Ni bronzes are shown. Ha (9)

Light Alloys Help Make Possible The Autotram, Latest Development in Railway Cars. *Metal Industry*, N. Y., Vol. 31, Apr. 1933, page 135. Autotram is designed for main line use by railroads, having a body made of light alloys, steel trucks, wheels of composite Al, rubber and steel construction, streamlined and with a 16 cylinder V-type gasoline engine. PRK (9)

Improved Steels for Mining. *Mining Journal*, Vol. 181, Apr. 22, 1933, pages 270-271. Recent developments in Cr-alloy and Mn steels, steels for balls in ball mills, casting technique, drill steel, use of Ni, etc., are reviewed. AHE (9)

Stainless Steel Buckets on 17000-Hp. Impulse Wheels. *Power*, Vol. 76, Dec. 1932, page 319. A feature of the largest single-runner Pelton water-wheels built in England is the use of stainless steel for those parts most likely to be subjected to erosion and corrosion. AHE (9)

Facts about the Manufacture and Care of Elevator Wire Ropes. *Power House*, Vol. 26, July 1932, pages 10-12. Three grades of wire ropes—Swedish Iron, Tracton Steel, Cast Steel—are taken into consideration besides the alloys—Cast Iron, Semi-Steel, Carbon Steel Castings—of which sheaves and drums are made. Eleven constructions of elevator ropes are discussed. Flexibility and bending properties of the ropes and causes of slippage are dealt with. Kz (9)

Steel vs. Rubber. *Railway Engineer*, Vol. 53, Oct. 1932, page 363; discussion, Nov. 1932, pages 407-408. Summarizes statements of Coil Spring Makers' Association of Sheffield on relative merits of both steel and rubber springs. Steel should be used for all types except very short springs (length less than 1½ times the diameter) where rubber is admittedly better. Its internal friction is a further advantage. The reviewer however rejects the claims regarding the Association's conclusion with respect to fatigue and corrosion resistance of steel springs. WH (9)

Aluminum on Shipboard. *Shipbuilding & Shipping Record*, Vol. 41, Feb. 9, 1933, pages 135-136. Description of Al alloys used for structural and decorative uses in ship construction deals with the Al-Si alloys known as Alpax, Wilmil, and Alakron which are highly resistant to corrosion and are suitable for castings, the high tensile alloy M.C. 7 obtained in sheet or section form and used for constructional strength members; and alloy Birmabright, with intermediate strength properties obtained as castings or as sheets or section. Use of Al paint is also referred to. JWD (9)

All Welded Hopper has Cast Steel Underframes. *Railway Mechanical Engineer*, Vol. 107, May 1933, pages 155-158. Details of construction and manufacturing of a 70 ton car with one-piece cast steel underframe of 48,600 lbs., bedframe of 13,000 lbs. and welded body. Ha (9)

Steel Tube in Inside Architecture. (Das Stahlrohr in der Innenarchitektur.) *Stahlbautechnik*, Supplement to *Montanistische Rundschau*, Vol. 25, Apr. 16, 1933, pages 1-4. Various possibilities of using steel tubes for furniture, radiators, banisters, etc., are discussed. Advantage: almost unlimited durability, low weight. GN (9)

Large Uses of Steel in Small Ways. 218th Article. Bobby Pins. *Steel*, Vol. 90, May 30, 1932, page 31. The manufacture of bobby pins in the U. S. requires 500 tons of steel wire for the production of over a billion pins a year. There are 22 manufacturers producing $3,000,000 worth of bobby pins and old type hairpins annually. The bobby pin uses a flat steel wire containing 0.70 to 0.95% C while the ordinary hairpin uses a round steel wire or low C content. The pins are machine formed, carefully heat treated and then colored. JN (9)

Large Uses of Steel in Small Ways. 219th Article. Gears. *Steel*, Vol. 90, June 13, 1932, page 32. Over 575,000 tons of steel are consumed annually in the manufacture of gears. The automobile industry uses the largest part of this, over 377,000 tons. The steel industry, itself, uses 25,000 tons of steel gears. Tractors, farm, road, and dairy equipment use another 25,000 tons. The rubber and chemical industries are also large users. About 85% of gears are made of plain C steels, although the use of alloy steels is increasing steadily. Of steel gears, 75% are spur type, 10% bevel, 5% worm, and the remainder, helical, spiral, etc. Steel gears range in weight from 1 oz. to 138 tons and from ½ in. to 21 ft. 4 in. in dia. JN (9)

Large Uses of Steel in Small Ways. 220th Article. Sanitary Containers. *Steel*, Vol. 90, June 27, 1932, page 35. A description of a sheet steel cart recently developed for the sanitary and odorless handling of household garbage pails. The cart is shipped in knocked down condition and can be assembled readily by the householder. JN (9)

Panels Made of Plied Steel and Wood Find New Uses. *Steel*, Vol. 90, May 30, 1932, pages 25-26. A description of Plymetl, a new material consisting of a metal face or faces firmly cemented to a stiff plywood panel. The panel may be wood veneer or wood fiber insulation board. The metal facing may be zinc coated steel, stainless steel, Al, Cu, Monel metal, etc. The material is light in weight and shows great stiffness and impact resistance with high strength. It is finding use as paneling for soda fountains, restaurant counters and hospital equipment. Other uses are: as state-room partitions, as side panels for commercial cars, buses and street cars, and for the construction of warehouse storage vaults, clothes vaults, refrigerators, etc. JN (9)

HEAT TREATMENT (10)

Heat Treatment of Cast Tools. (Die Wärmebehandlung gegossener Werkzeuge.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Feb. 12, 1933, page 89. Certain types of machine tools are cast. Fe-Cr-W alloys with or without Ni and Co are used for this purpose. The wear resisting properties of such tools can be considerably improved by heating to 700°-900° C. for a short time. (10)

Heat Treating in the Specialty Tool Plant. M. F. Dorner. *Metal Progress*, Vol. 22, Oct. 1932, pages 28-32. Methods and equipment used by the Cleveland Cutter and Reamer Co. in the heat treatment of a wide variety of small tools are described. Furnace atmosphere control for various kinds of work is discussed. WLC (10)

Heat Treating Important Link in Airplane Engine Construction. Herbert R. Simonds. *Iron Age*, Vol. 129, Mar. 17, 1932, pages 666-669. Various types of steels used for the different parts and corresponding heat treating cycles are carefully developed and standardized in the manufacture of Wasp and Hornet engines. As far as possible S.A.E. steels No. 2512, 3140 and 6150 are specified for the different parts. Furnaces are electrically operated and automatically controlled. Metal used in master rod bearing is composed of 70 Cu and 30 Pb. Handling of material through heat treating department has been carefully arranged to give a minimum of lost motion. Careful regulation of plating process gives proper protection with coating not over 0.001" in depth. VSP (10)

Sorbitization of Railroad Tires. A. A. Metanev. *Domez*, No. 10, 1932, pages 31-35. (In Russian.) Following procedure was developed for production of hard and tough tires free from cracking: roll as cold as possible, not higher than 1150° C. at the start; during forming continuously spray with water; cool in air until the rim is at 800° C.; dip in water for 2-3 seconds; hold for 10-15 seconds in the air; quench from 70 to 45 seconds in water depending on carbon content; cool in air. (10)

Liquid Baths for Heat Treating—Medium-Temperature Salt Baths. W. Paul Eddy, Jr. *Iron Age*, Vol. 130, Nov. 10, 1932, page 721, adv. page 16. Fifth of a series of articles. Medium temperature baths are used for heating C and many alloy steels for normalizing, annealing and hardening, for quenching and drawing high-speed steels and for heating brass, bronze, Ni-Ag, Cu-Au and other non-ferrous metals and alloys. Salt mixtures for use in medium temperature range generally composed of chlorides or of chlorides and carbonates. Gives a number of formulae which may be used successfully. VSP (10)

Heat Treating of Rail Ends. *Railway Engineer*, Vol. 53, Mar. 1932, page 87. New method of hardening rail ends in track to resist wear under heavy traffic consists in building up of battered ends by welding, heating to 1450° F. for about 2" from each end and cold water quenching. It was found desirable to add to this treatment a reheating to 650° F. and a natural cooling out of rail ends after quenching with a view to relieving internal strains and to eliminate shelling and chipping. A slight bevelling of the top corners prevents any contact between the flowed metal during hot weather. The physical properties are affected as follows:

	Tensile Strength	Elongation	Reduction of Area	Brinell
Before heat treatment	57	13.5	17	260
After heat treatment	88	7	23.5	325-360

WH (10)

Liquid Baths for Heat Treating—Sodium and Other Cyanides. W. Paul Eddy, Jr. *Iron Age*, Vol. 130, Sept. 15, 1932, pages 406-407. Second of a series of articles. NaCN is most commonly used of case hardening baths. Bath is usually made up of NaCN and NaCl sometimes with addition of Na_2CO_3. Active case-hardening agent in cyanide bath is cyanogen gas. Most widely used steels for parts which are cyanide-hardened are S.A.E. 1112, 1120 and 1020. Some plants use a floating slag of $Ca(CN)_2$ as active agent, bath itself is neutral. Work heated in this bath is difficult to clean. There are also other uses for case-hardening baths. VSP (10)

Liquid Bath For Heat Treating—Medium Temperature Baths. W. Paul Eddy. *Iron Age*, Vol. 130, Dec. 8, 1932, pages 882-883. 6th installment of a series of articles. Deals with the use of rectifiers, boric acid and its derivatives, for medium temperature salt baths to lessen decarburization in chloride bath. VSP (10)

Liquid Baths for Heat Treating—High Temperature Salt Baths. W. Paul Eddy, Jr. *Iron Age*, Vol. 130, Dec. 22, 1932, page 959, adv. sec. page 18. 7th of a series of articles. Basis of salt baths above 1800° F. is borax. High temperature salt baths are not eutectic, but when heated, soften gradually and finally become liquid. Melting range is usually between 1600° and 1800° F. For preheating some salt is sometimes used, maintained just above melting point. Greatest disadvantage of high temperature bath mixtures is that none of them is easily cleaned from the work. Fairly pure salt should be used in making salt baths. Gives general operating rules. VSP (10)

Heat Treating Furnace Atmospheres. Sam Tour. *Metals & Alloys*, Vol. 3, Dec. 1932, pages 270-272. Classifies furnaces according to rapidity of change taking place in their atmosphere. Transient atmosphere furnace, fuel fired hearth or oven type, and quiescent atmosphere furnaces, muffle furnaces electrical or fuel fired, are briefly discussed. Effect of presence of water vapor in quiescent atmosphere of combusted fuel gas and activity of hot surface of work are discussed as they affect gas reactions. It is pointed out that a "neutral" atmosphere depends upon material which is exposed to it and temperature. At hardening temperatures for C tool steels very appreciable amounts of O, around 4%, result in no scaling or decarburization. For heat treatment of C steels, Cr-V, and preheating of high speed steels at temperatures of 1600° F. 2-3% of O is necessary to prevent decarburization. At higher temperatures used for quenching high speed steel O must be eliminated and at 2400° F. 10% CO is necessary. WLC (10)

Hardening (10a)

Rim Toughened Wheels. *Iron & Coal Trades Review*, Vol. 125, Oct. 14, 1932, page 571. By a special process wheels are heated to proper temperature to refine grain structure of steel and then rotating rim of wheel in water and immediately after this drawing or tempering to remove all injurious stresses. Wheels treated in this manner gave 100% more mileage. Ha (10a)

Secondary Hardness of High-speed Steel. *Machinery*, London, Vol. 40, June 30, 1932, page 392. To temper high-speed steel with the aim of producing "secondary hardness," it should be reheated to 550/600° C. and then placed into an air blast or quenched in oil. All high-speed steel tools are improved by tempering in this way. Kz (10a)

Annealing (10b)

Heat Treatment without Detrimental Finish. *Metal Industry*, London, Vol. 41, Dec. 9, 1932, pages 565-567. A discussion on methods of bright-annealing of various metals, success of it according to treatment and furnace used. Ha (10b)

Annealing Cast Iron. (Das Ausglühen von Grauguss.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Feb. 5, 1933, pages 45-46. After discussing the various cases when cast Fe is to be annealed, temperature and duration of the annealing process as well as changes taking place in physical properties and structure are considered at length. Annealing furnaces and the advantages derived from annealing are considered. GN (10b)

Case Hardening & Nitrogen Hardening (10c)

The Role of Nickel in Nitriding Steels. H. J. French & V. O. Homerberg. *Transactions American Society for Steel Treating*, Vol. 20, Dec. 1932, pages 481-506. Includes discussion. Data are given to support conclusion that Ni has advantages of strengthening and toughening case with only moderate decrease in case hardness of nitrided steels, that its strengthening and hardening effects on core provide a better support for case, and that development of dispersion hardening phenomena in steels containing appreciable percentages of Al increases core strength and elastic properties during nitriding. As a result of these effects Ni may be added in proportions to vary at will properties of nitriding steels with respect to toughness-hardness relations of case and core thereby meeting a range of service requirements. Effective use of Ni requires a balance with other alloying elements and number of typical nitriding steels are described showing beneficial effects of Ni. 8 references. WLC (10c)

Nitrided Gauges. J. W. Foster. *Fuels & Furnaces*, Vol. 10, Apr. 1932, pages 255-260. Advantage of nitriding gages is great surface hardness of about 1000 Brinell which can be obtained with proper technique. Material to be used, procedure and examples of nitrided gages are described. Ha (10c)

Theory and Practice of Nitrogen Case-Hardening. A. Fry. *Engineering*, Vol. 133, May 13, 1932, pages 579, 587-588; *Iron & Coal Trades Review*, Vol. 124, May 6, 1932, pages 749-751; *Heat Treating & Forging*, Vol. 18, May 1932, pages 306-308; June 1932, pages 360-361, 366. Paper read before the Iron & Steel Institute. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 10. MS + Ha + LFM (10c)

Coppering as Protection against Carburizing in Case Hardening. (Die Verkupferung von Werkstücken zum Schutz gegen Kohlung bei der Einsatzhärtung.) W. Hermann. *Werkstattstechnik*, Vol. 26, Dec. 1, 1932, pages 461-462. Coppering for this purpose is sometimes said to be unsafe. This is only lack of proper experience as is shown by comparing common coppering practice with this peculiar technical purpose (resistance to high temperature and chemical attacks of different carburizing compounds). .05 to .025 mm. are upper and lower limits of Cu layer varying with carburizing depth required. Incoherence of the protective cover not only endangers zone to be protected, but also parts to remain uncovered because it may gather upon them and prevent carburization. Preparation of surface to be coppered and hardened is described and solutions of electrolyte mentioned. RFV (10c)

Case-Hardening of Steel in Molten Sodium Cyanide. H. N. Beilby & W. Nelson. *Iron & Coal Trades Review*, Vol. 125, July 1, 1932, pages 8-9; July 8, 1932, pages 40-41. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 117. Ha (10c)

Some Experiments on the Nitrogen-Hardening of Cast Iron. J. E. Hurst. *Foundry Trade Journal*, Vol. 46, May 5, 1932, pages 279-282; *Engineering*, Vol. 133, May 6, 1932, pages 555-556. Paper read before the Spring Meeting of the British Iron & Steel Institute. See *Metals & Alloys*, Vol. 4, Jan. 1933, page MA 10. OWE + LFM (10c)

The Nitrogen Hardening of Alloy Steels. (Die Härtung legierter Stähle durch Stickstoff.) O. Meyer & W. Eilender. *Mitteilungen aus dem Institut für Eisenhüttenkunde der Technischen Hochschule zu Aachen*, Vol. 11, 1932, 4 pages. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 72. Ha (10c)

Comparative Investigations on Surface Hardening of Steel Shafts by Welding Flames. (Vergleichende Untersuchungen über die Oberflächenhärtung von Stahlwellen durch Schweissflammen.) M. Meier & E. Zorn. *Autogene Metallbearbeitung*, Vol. 25, Nov. 1, 1932, pages 325-330; *Forschungsarbeiten auf dem Gebiete des Schweissens und Schneidens mittels Sauerstoff und Azetylen*, Series 7, 1932, pages 70-75. Discusses 3 possible methods of surface hardening: (1) by absorption of C, cementation; has drawback that toughness is reduced and deformations take place; (2) by absorption of N, nitriding, using a temperature of 580° C, only so that inconveniences of (1) do not occur; (3) by quenching, but only for steels with at least 0.3% C. Piece must be heated to a temperature where state of solid solution is reached. While in (1) and (2) a chemical change takes place, a physical change occurs in (3). Investigations were made of uniformity of hardness, burners and gases used and their influence on final result, and a comparison of costs made which has only limited value as local conditions for wages and general overhead vary greatly. It could be stated that oxy-acetylene flame is by far superior to city gas-oxygen flame. Uniform hardness over required hardened area can be obtained by proper arrangement and construction of burners. Ha (10c)

Case Carburizing in Fused Cyanides. H. B. Northrup. *Transactions Electrochemical Society*, Vol. 60, 1931, pages 49-53; *Iron & Coal Trades Review*, Vol. 124, June 3, 1932, page 921; *Heat Treating & Forging*, Vol. 18, Apr. 1932, pages 238-239, 244. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 71. MS + Ha (10c)

Why Carburise So Much? W. F. Chubb. *Metallurgia*, Vol. 6, Sept. 1932, pages 167-168. Disadvantages of carburizing are stressed, and it is suggested that many carburized parts can be replaced by materials having a less tough core. JLG (10c)

Case-Hardening of High-Speed Steel. (Einsatzhärtung von Schnellarbeitsstahl.) Wilhelm Oertel. *Stahl und Eisen*, Vol. 52, Apr. 21, 1932, pages 393-394. Circular samples of high-speed steel containing 0.69% C, 14% W, and 3.5% Cr were case-hardened at varying temperatures from 750° to 1000° C., using both charcoal and leather charcoal. At 850° C. for ordinary charcoal amounts of C absorbed for depths 0 to 0.5 mm., 0.5 to 1.0 mm., and 1.0 to 1.5 mm., were 1.1%, 1.0%, and 0.72%, respectively. Leather charcoal gave higher amounts of absorbed C. Martensite was present at 1% C zones. Further tests in a small electric-arc furnace consisted of making a melt of steel containing 1% C, 14% W, and 3.5% Cr, and quenching at 1100° to 1250° C. Martensite was found throughout samples quenched from 1150° to 1250° C., yet no martensite existed in those quenched from 1100° C. For a definite C-content in high-speed steels, a definite hardening structure was found. Charcoal is recommended for case-hardening of this class of steel. DTR (10c)

Steels for Casehardening. Francis W. Rowe. *Metallurgia*, Vol. 7, Nov. 1932, pages 14-16; Dec. 1932, pages 53-54. Discusses steels used for carburizing and relative advantages of each type. JLG (10c)

Endurance of Steel with a Nitrided Case. Correspondence from Walter Rosenhain. *Metal Progress*, Vol. 22, July 1932, pages 56-57. In discussing current theory of nitride hardening, which explains phenomenon on basis of ferrite space lattice distortion by nitrides (particularly Al). Writer points out that such a conception is not supported by X-ray examination of lattice of nitrided steel. WLC (10c)

Present Status of Case Hardening. (Der derzeitige Stand der Einsatzhärtung.) G. Schilling. *Werkstattstechnik*, Vol. 26, Oct. 15, 1932, pages 396-400. Complete description of application and of procedure with solid, liquid and gaseous compounds. Comparison of various ways of protecting certain parts against hardening. Comparison of containers made from different materials. Temperatures, catalysts, etc. 14 references. RFV (10c)

Continuous Carburizing by Means of Gas. R. J. Cowan. *Fuels & Furnaces*, Vol. 10, June 1932, pages 393-397. Describes installation and operation of a furnace for continuous carburizing with a hydrocarbon gas mixed with the products of combusion of a gas-fired furnace containing from 8-10% CO_2. See also *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 249. Ha (10c)

Surface Hardening Scientifically. A. E. Shorter. *Metallurgia*, Vol. 7, Nov. 1932, pages 3-4. The Shorter process for surface hardening by means of the oxy-acetylene torch gives much more uniform results than are secured by hand operation of the torch. JLG (10c)

Drawing (10e)

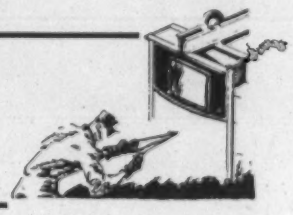
Tempering of Steels Containing Vanadium. *Metallurgist*, Sept. 1932, pages 134-136. A review of published work. VVK (10e)

Aging (10f)

Age Hardening in Strip Steel. Earl B. Whittemore. *Metal Progress*, Vol. 22, Oct. 1932, pages 50-52. Abstract of a paper for the Buffalo Convention, A.S.S.T., Oct. 1932. Increase in hardness of basic open-hearth low carbon strip steel immediately after finishing is discussed. The temper and general specifications of this type of steel are defined. The increase in hardness is noticeable in 5 days after rolling. Tests on various gages of strip steel over two years time are presented graphically as percent increase in hardness. Annealed material behaves erratically in hardness increase, but is generally slower. Rockwell hardness B50-80 show the greatest amount of age hardening. Higher C steels show little age hardening. The explanation for this phenomenon, ascribed to precipitation hardening by some authorities, is discussed. Specifications for strip steel in this carbon range should make allowance for age hardening. WLC (10f)

Castings Hardened from Below Critical. Charles W. Briggs. *Metal Progress*, Vol. 22, Oct. 1932, pages 53-56. Abstract of a paper for the Buffalo Convention, A.S.S.T., Oct. 1932. "Low internal stress heat treatment" (heat treatment below the critical range), to avoid the internal stresses usual in quenching from above the critical range is discussed. Results of tests on a cast steel of 0.25% C are tabulated. Following low quench, the specimens were allowed to age harden at room temperature, 50° and 100° C. The hardness after lapse of time is presented graphically. The maximum hardness was reached in 30 days. This hardness is a permanent property as shown by tests. Tensile properties of low quenched and age hardened steel castings are also tabulated. Quenching below the critical point avoids cracks due to non-uniformity of temperature in rapidly cooling castings. Annealing is recommended for castings that require more elongation and contraction than they have as cast. WLC (10f)

Is Your Heat Treating Plant Up-to-date?



This section digests the world's heat treating practices.

Aging of Metals After Straining by Tension. (Sur le vieillissement des métaux après écrouissage par traction.) J. Galibourg. *Revue de Métallurgie*, Vol. 30, Mar. 1933, pages 96-111. A cold drawn wire does not show any elastic limit or any breaks in its stress-strain diagram even when it is allowed to age for a sufficient time. When the same cold drawn wire is stretched to a certain extent in a tensile machine, allowed to age and is then tested for physical properties, the elastic limit appears again on the stress-strain curve at a point somewhat higher than the amount of stretching given to it during the first application of the load. A series of experiments using 10% cold reduction and different amounts of straining shows that 70 days aging at 15° C. does not restore elastic limit even in the stretched steel, but the same aging followed by aging for 20 minutes at 160°-170° C. produces this effect. Aging at 160°-170° C. is, however, able to accomplish this alone, though not as pronouncedly as when combined with the action of aging at room temperature. When the bars are more severely cold drawn aging either at room temperature for 70 days or at 160°-170° C. is not sufficient to restore the elastic limit, both when the bars are in the original cold drawn state or stretched afterwards in a tensile machine. They must be cold-drawn, aged, stretched and aged again before an elastic limit can be distinguished. Repeated stretching for small amounts followed by aging showed that the smallest strains repeated many times finally produce highest elastic limit though elongation decreases before rupturing. Loading a polished strip until its surface was partially covered with the strain lines, heating it for 2 hours at 100° C., polishing and loading again showed that area where the original strain lines were absent turned dull while areas which were strained before remained brightly polished. Elastic limit of strained part was evidently raised, which could be seen on stress-strain diagram. Increased elastic limit and tensile strength of steels pulled at elevated temperatures, 100°-400° C. can be explained by the aging action of strained steel during tensile testing. JDG (10f)

Malleableizing (10g)

Present Status of Production of High Quality and Short-Cycle Malleable Castings in the U. S. A. (Der heutige Stand der Herstellung von hochwertigem und schnell Temperguss in den Vereinigten Staaten). H. Nipper. *Die Giesserei*, Vol. 19, Nov. 25, 1932, page 479. Review of present melting methods compositions and alloys for malleable iron. Annealing, furnaces, and attempts to shorten annealing times are discussed. Ha (10g)

Black-Heart Fractures in White-Heart Malleable Cast Iron. (A Study in Annealing.) J. V. Murray. *Foundry Trade Journal*, Vol. 47, Sept. 1, 1932, pages 121-124, 129. The author summarizes the results of his experiments as follows: Black-heart fractures are due to insufficient annealing and are caused by the presence of nodular C. During annealing of white-heart malleable decomposition of free carbide, oxidation of C held in solution, and reabsorption of deposited C and diffusion of the same to replace eliminated C occur. The so-called "picture frame" is due to the mobility and decomposition of the carbide in solution, causing (a) a zone of supersaturated austenite and (b) pressure from the inside due to the graphitization of the austenitic and free carbides. Very little C is eliminated until the carbide is broken down, the physical reactions in this case tending to ease up the chemical reaction of the ferric oxide. The reabsorption of C increases the tensile strength and decreases the ductiliy of the material. No explanation of the loss and increase of S is offered. OWE (10g)

Properties and Production of Malleable Fittings, Brand GF. (Qualitätseigenschaften und Herstellung von Tempergussfittings Marke GF.) *Apparatebau*, Vol. 44, Nov. 11, 1932, pages 153-155. Discusses in detail manufacture and control of fittings handled by one of largest manufacturers, Georg Fischer Co., Singen, Germany. Casting, grinding, straightening, polishing, thread cutting and various controls between production stages and final inspection are considered. GN (10g)

Shortening of the Annealing Process in Malleableizing. (Verkürzung der Glühdauer bei der Tempergusserzeugung.) Virgilio Wollenigh. *Maschinenbau*, Vol. 11, Mar. 3, 1932, page 97. Paper, International Congress of Foundrymen in Milan, Sept. 1931. Time of annealing in malleableizing can be shortened by increasing temperature to about 1000° C., lowering C content and raising Si content. Time of annealing will be reduced under these circumstances to 35 to 40 hrs. Malleable Fe produced by this method shows a structure of graphite and ferrite with some pearlite. Tensile strength will be 35-40 kg. and elongation 7-10%. Main difficulty is always to have same analysis of cast Fe. RFV (10g)

JOINING OF METALS & ALLOYS (11)
Welding & Cutting (11c)

Rules for Welded Steel Constructions. (Vorschriften für geschweisste Stahlbauten.) F. KRYNES. *Zeitschrift des Österreichischen Ingenieur- und Architektenvereins,* Vol. 84, Dec. 16, 1932, pages 275-276. Discussion on new German rules (D I N 4100) for welded steel constructions with purpose of establishing similar rules in Austria. Papers before Austrian committee on welding technique are briefly reviewed. W. Hoffmann: Welding in building and bridge construction with special reference to D I N 4100 and fatigue loading, Gollwitzer: Introduction of various welding methods in repair shops of German Railway System. Proposals are discussed. GN (11c)

Electric Arc Welding in Ship Construction. J. FOSTER KING & JAMES MONTGOMERIE. *Engineering,* Vol. 133, Mar. 18, 1932, pages 356-358; *Engineer,* Vol. 153, Mar. 25, 1932, pages 333-334. Includes discussion. Abstract of paper read before the Institution of Naval Architects, Mar. 16, 1932. See *Metals & Alloys,* Vol 4, Jan. 1933, page MA 11. LFM (11c)

Are Modifications Needed in Welding Code? ROBERT E. KINKEAD. *Steel,* Vol. 90, May 23, 1932, pages 31-32. An analysis of new welding code of the American Society of Mechanical Engineers in light of its commercial practicality. JN (11c)

Protecting the Welder. F. H. KLEIN. *Welding,* Vol. 3, Nov. 1932, pages 632-634. Proper safety equipment should be provided to protect the welder against dangerous radiations and poisonous fumes. TEJ (11c)

Have You a Joining Problem?

From January to July 1933 this section digested 399 articles on welding, cutting, soldering, brazing and riveting.

Arc Welds of Monel Metal Plated and Nickel Plated Steel Plates. (Lichtbogenschweissen von Monel- und Nickel-plattierten Stahlblechen.) RUD. MÜLLER. *Elektroschweissung,* Vol. 3, Dec. 1932, pages 229-230. Rules to be followed in welding such plates which find increasing use in apparatus construction are considered. Examples are described and illustrated. Electric, carbon arc and Arcatom method are used to best advantage. GN (11c)

Shaping with Local Heating by Means of Oxy-Acetylene Torch. (A Propos des Chaudes de Retrait.) A. DESGRANGES. *Revue de la Soudure Autogène,* Vol. 24, May 1932, page 2521. It is possible, using expansion or shrinkage due to local heating followed by cooling, to shape pieces as desired. Heating by torch appears more costly than by forge fire but if all factors (such as handling cost, difficulties for setting fire at correct spot, etc.) are thoroughly considered, the reverse seems true. Use of torch for local heating in shaping members offers possibilities which so far have not been fully realized. Author gives an application of method for bending oil line pipes. End of tube is pulled with a cable and tube is rapidly and locally heated with one or more powerful torches (about 200 liters of acetylene/hr./mm. of tube plate thickness). Local heating is repeated as many times as necessary. FR (11c)

Consumer Acceptance in the Welding Industry. T. C. FETHERSTON. *Welding,* Vol. 3, Oct. 1932, pages 579-580, 584. Paper presented at Fall meeting of American Welding Society in Buffalo, Oct. 1932. Author believes that manufacturers of welded products should seriously consider marketing advantage given their products by welding. TEJ (11c)

Some Methods and Effects of Machine Gas Cutting. L. M. CURTISS. *Sheet Metal Industries,* Vol. 5, Apr. 1932, pages 856-859. Paper before the 32nd Annual Convention of International Acetylene Association. See *Metals & Alloys,* Vol. 3, July 1932, page MA 216. AWM (11c)

Leaking Couplings and Corrosion of Pipe Lines Permanently Repaired by Use of Welding. A. M. HILL. *Oil & Gas Journal,* Vol. 31, Sept. 29, 1932, pages 120-122. Badly corroded pipe is repaired by splitting a casting 2″ larger than the pipe and oxyacetylene welding this casing around the pipe. Leaking couplings are similarly encircled by welded sleeves. Isolated pits are spot welded. Temporary repairs are made by improved saddle clamps. VVK (11c)

Influence of a Magnetic Field Parallel to the Iron Arc on Welding. F. R. HENSEL & W. A. MADDOX. *Journal American Welding Society,* Vol. 11, Oct. 1932, pages 5-9. Paper presented at Fall meeting of American Welding Society in Buffalo, Oct. 1932. Phenomenon of arc blow can be largely corrected by means of a.c. and d.c. longitudinal fields. Deposition efficiency has been found to be a function of field intensity. With stronger fields deposition efficiency decreases, decrease being much more pronounced with d.c. than with a.c. fields. It is possible to correct arc blow with an a.c. field and still have about 70% deposition efficiency. Spread and penetration are not affected appreciably with a.c. fields, while with d.c. fields spread is increased and penetration decreased. N absorption with d.c. fields is higher than with a.c. fields, although some increase of N pick-up with increasing a.c. field was evident. Oscillograms show that application of a longitudinal field only slightly changes electrical characteristics of arc. Gyroscopic stabilization of arc is discussed. TEJ (11c)

Development of Electric Welding in Ship Building. (Die Entwicklung der elektrischen Schweissung im Schiffbau.) BURCKHARDT. *Die Elektroschweissung,* Vol. 3, Oct. 1932, pages 181-190. Paper before Deutsche Gesellschaft für Elektroschweissung, June 15, 1932, Berlin. Historical survey on the application of electric welding in ship construction is given with special reference to requirements such welds have to meet, and weight savings that can be effected. Skilled welders make butt welds of normal structural steels for ship building purposes that have more than 100% of tensile strength of parent plate and average at least 90%. Similar results are attained on steel St. 52 with proper welding electrodes. Various types of riveted, welded, riveted and welded constructions were tested, among other pieces 6 m. long and 1.9 m. wide. Results show that welding affords a considerable reinforcement of ship body against tension stresses. Comparative tests on riveted and welded constructions prove superiority of welded constructions against effects of shocks and explosions. Specifications on construction and welding are given. GN (11c)

All-Electrical Arc-Welded Steel Penstock. CLAYTON M. ALLEN. *Journal American Welding Society,* Vol. 11, Nov. 1932, pages 22-25. Paper presented at Sept. 1932 meeting of Los Angeles Section, American Welding Society. Describes erection of 1400 foot penstock with particular reference to welding operations. All welds were made by means of shielded carbon arc and shielded metallic arc processes and, with certain exceptions, were required to meet the A.S.M.E. Boiler Construction Code for Unfired Pressure Vessels, Class 1. Welding details for field joints as well as statistics in regard to electrode and energy consumption are included. TEJ (11c)

The Electric Arc—An Agent of Maintenance. W. W. REDDIE. *Electric Journal,* Vol. 29, Dec. 1932, pages 552-554. Since electric arc welding is no longer hampered by lack of knowledge of procedure, available operating personnel, or material and machinery developments it is largely used in the repair of light and heavy equipment for manufacturing, transportation and construction. Machinery or equipment parts are reclaimed. Buildings and bridges are modified. Many examples are cited. CBJ (11c)

Influence of Gas Cutting on the Mechanical Properties of Steel. (Influence de l'Oxy-Coupage sur les Propriétés Mécaniques le l'Acier.) L. DE JESSEY. *Bulletin de la Société des Ingénieurs Soudeurs,* Vol. 3, Jan.-Feb. 1932, pages 511-524. Lecture before Société des Ingénieurs Soudeurs. Owing to large variety of steels, it is impossible to study the question for all kinds. C steels only are dealt with. Gas cutting which is essentially the combustion of steel in O acts in 2 ways, chemically and thermically, on metal. Under microscope border of cut shows following zones: (1) carburized zone of about 0.1 mm. Cause of C pick up is not thoroughly known. Carburization is very low for mild steel. (2) Hardened zone. There metal is only affected by heating and structural changes depending upon temperature, soaking time, cooling rate, metal composition. Temperature reached is mainly a function of thickness of metal to be cut (martensite is seen in normal steel and austenite in steel with higher C content). (3) Transition zone structure of which is intermediate between quenched and annealed ones (troostite is present in this zone). Tensile strength, hardness, bending, shock resistance, are compared on gas cut and tool cut samples. Studies show that results would be better on gas cut than on sheared or friction sawed samples. It can be accepted that gas cutting has no harmful effect on normal steel. Mild steel can be used in the as cut condition. Results on steels with higher C content would not be so good. There are 2 means for treating modified zone (1) removing, by means of grinding, brittle carburized superficial zone. This should be applied to steel with C content higher than 0.4%. If excess brittleness is feared, quenched zone can also be removed but in any case, resistant transition zone must be kept. Thickness of removed metal will be 0.5 mm. max. for thin plates and 1 mm. for members up to 150 mm. (2) Heat treating (regenerating treatment) can be applied but this can only be performed under careful control. Generally speaking annealing improves shock resistance but, for low C steel, reverse proves true. FR (11c)

Contribution to Symbols for Welded Joints. (Beitrag zu den Zeichnungssymbolen für geschweisste Verbindungen.) G. E. HUSS. *Autogene Metallbearbeitung,* Vol. 25, Nov. 15, 1932, pages 342-344. Series of symbols is suggested both for welding methods and operating methods which at once give information on what kind of welding (arc, gas, etc.) is to be employed and what effect is to be obtained (refining at certain temperature, pencil material, etc.). International acceptance is recommended. Ha (11c)

Load Test on a Welded Roof Truss. C. H. JENNINGS. *Journal American Welding Society,* Vol. 11, Dec. 1932, pages 9-11. Discussion by A. M. Candy of paper presented at Annual Meeting of American Welding Society in Buffalo, Oct. 6, 1932, and published in *Journal American Welding Society,* Vol. 11, Sept. 1932, pages 13-18. Details of construction and erection of a frameless steel house erected in Solon, Ohio. Entire shell of house is constructed of 16, 18 and 20 gage Armco Fe and is shop and field welded in a very novel form of design. TEJ (11c)

Load Test on a Welded Roof Truss. C. H. JENNINGS. *Journal American Welding Society,* Vol. 11, Dec. 1932, pages 11-13. Discussion by F. P. McKibben of paper presented at Annual Meeting of American Welding Society in Buffalo, Oct. 1932 and published in *Journal American Welding Society,* Vol. 11, Sept. 1932, pages 9-11. Calculation of theoretical vertical deflection of truss described by Jennings gives 1.02″ which corresponds closely with observed 1.08″. TEJ (11c)

Use of Gas Cutting in Railway Construction. (L'Emploi de l'Oxy-Coupage dans la Construction du Materiel de Chemin de Fer.) R. MESLIER. *Revue de la Soudure Autogène,* Vol. 24, May 1932, page 2513. Metal in neighborhood of cut is composed of following zones: (1) extremely thin film in which a slightly higher C content can be noted, (2) hard martensitic zone, (3) troostitic transition zone. But faces of cut are always machinable by ordinary means; hard zone does not resist file, cutters (milling tools) or other tools. In most cases it is advisable to leave section in the as cut condition. Tests have proved that a gas cut strip is more easily bent without showing cracks than one obtained by shearing. FR (11c)

Boilers Made by Using Fusion Welding. (Travaux de Chaudronnerie Réalisés par Soudure Autogène.) R. MESLIER. *Revue de la Soudure Autogène,* Vol. 24, June 1932, pages 2534-2535. Example of very intricate boiler element made of oxyacetylene welded tubes is given. This element has undergone successfully a hydraulic pressure of 60 kg./cm.^{2} Despite short distances between welds and intricacy of tube structure no distortion was to be noted with a correct working practice. Another example consists in an apparatus for treatment of rosin, inside walls of body and tubes being of welded Al and outside ones of welded steel. This apparatus was also subjected successfully to a relatively high testing pressure. Similar equipments used in dyeing, dairy and chemical industries can be made also by welding Cu, Al, Monel metal and stainless steels. FR (11c)

Latest Structural Welding Developments. FRANK P. MCKIBBEN. *Canadian Engineer,* Vol. 63, July 19, 1932, pages 15-17. Welding data on six, 9-19 story buildings are given with particular detail of the Boston City Hospital's Pediatric Building. VVK (11c)

Fusion Welding of Brass. (La Soudure Autogène des Laitons.) R. MESLIER. *La Revue de la Soudure Autogène,* Vol. 24, June 1932, pages 2538-2539. Welding is made possible by using a special flux (chiefly composed of borax and boric acid) which covers welding rod and is applied on opposite side of seam and by using a torch the flame of which is highly oxidizing. Ratio between O and acetylene varies from 1.2 to 2.5 with oxidizing flame; surface of liquid metal is covered with a semi-liquid film and numerous solid particles of Zn oxide. Two-fold aim of film is (1) to prevent volatilization of Zn, (2) to protect remaining metal against oxidation. Film thickness depends upon the O content of flame gases and upon Zn content of metal. If too thin, it does not prevent Zn from escaping, if too thick, it entraps liquid metal and prevents its adherence to the piece. As film thickness is also a function of temperature of piece to be welded, flame must be more oxidizing at beginning to have a thicker film when the piece is cold and heat transmission very easy. FR (11c)

Thermal Stresses in Welded Bars. (Wärmespannungen in geschweissten Stäben.) KARL MELCHER. *Die Elektroschweissung,* Vol. 4, Jan. 1933, pages 7-9. Author first reviews former investigations and shows that method proposed by Sandelowsky (*Die Elektroschweissung,* Vol. 2, 1931, page 48) for determining thermal stresses does not attain its object. Bending and tension stresses set up in welded bars are calculated. Upon superposition of thermal-tension stresses and bending stresses they are equalized to largest extent when bar distorts. For stresses remaining following conditions hold true: (1) total of tension stresses must equal total of compressive stresses, else bar would lengthen or shorten. (2) Total of moments of residual stresses about any point must be zero, or further bending would occur. When a layer of the bar is removed following changes take place: (1) Among residual stresses compressive stresses prevail so that bar will lengthen till compressive and tension stresses are again in equilibrium. (2) Total of moments is no longer in equilibrium, i.e., bar will warp till equilibrium is reached. New residual stresses result: dislocation of these remaining stresses is renewed upon each removal of layers. In conclusion author states that deflection of bar is not sufficient to determine thermal and residual stresses; measurements of change in length are required upon every removal of layers. Practical tests show that cutting off of strips is better than machining to explain stress distribution. GN (11c)

WORKING OF METALS & ALLOYS (12)

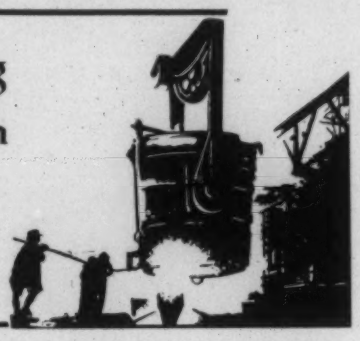
Melting & Refining (12a)

Basket Charging of Electric Furnaces. (Die Korbbeschickung für elektrische öfen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Dec. 4, 1932, page 652. Charging method described as used in a German steel plant considerably decreases charging time, lowers current consumption and increases furnace output/hr. GN (12a)

Non-metallic Inclusions in Steel Castings. (Nichtmetallische Einschlüsse im Stahlguss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Nov. 27, 1932, pages 474-475. Paper considers various causes of non-metallic inclusions in steel castings, (1) inclusions in charge, (2) inclusions formed by deoxidation process, (3) inclusions from ladle lining and mold. Methods to eliminate such inclusions are dealt with. Deoxidation with Al seems to be particularly suitable for attaining sound castings free from sulphides. GN (12a)

Are You Keeping Up-to-date on Modern Melting Practice?

The Abstracts tell what is going on.



The System FeO-SiO_2. N. L. Bowen & J. F. Schairer. *American Journal of Science,* 5th series, Vol. 24, Sept. 1932, pages 177-213. The melts were made in crucibles of pure electrolytic Fe. Fe can not reduce all the Fe_2O_3 to FeO, so that all the melts contained Fe_2O_3 and the true diagrams are ternary (FeO, Fe_2O_3 and SiO_2). Fe_2O_3 is greatest when no SiO_2 is present, the solids in equilibrium being wüstite (FeO solid solution) and Fe, and the content of Fe_2O_3 in the liquid 11.5%. Fe_2O_3 decreases rapidly with addition of SiO_2 while wüstite and Fe are the solid phases. With fayalite and Fe as the solid phases, Fe_2O_3 decreases less rapidly with added SiO_2. When SiO_2 and Fe are the solids, Fe_2O_3 decreases still less rapidly. With liquid compositions close to fayalite (Fe_2SiO_4), Fe_2O_3 is 2.25%. With so little Fe_2O_3 in the high SiO_2 ranges, results can be plotted as a binary diagram. There is a maximum at the composition of fayalite of 1205° C., a eutectic between fayalite and tridymite at 1178° at FeO 62, SiO_2 38%, and also between fayalite and wüstite at 1177° at FeO 76, SiO_2 24%. AHE (12a)

A New Method for Dephosphorization of Cast Irons in a Basic Converter. (Nouveau procédé de déphosphoration des fontes au convertisseur basique.) F. Bicheroux. *Révue de Metallurgie,* Vol. 29, Nov. 1932, pages 531-541. Addition of large amounts of lime to the vessel required in basic converter practice chills the metal, renders its mass more viscous on account of the suspended lumps of the flux and lengthens the process besides requiring a considerable overblow for sufficient dephosphorization. The lime should be added so as to eliminate these drawbacks. It must be present at any time in the quantities sufficient for the formation of fusible slag. A converter is started with about 20 kg. of lime/ton of the charge. Further lime addition is made by blowing finely pulverized dry lime through tuyeres with the blast. Coarsely ground lime is carried through the bath. With lime pulverized to pass 200 mesh perfect absorption in the slag is obtained. The flux is fed into blast main from a hopper with an endless screw. More than 15 heats made in different plants using this method proved its value. Time of the blow is shortened; there is no necessity for taking samples so that the converter can be run by the appearance of the flame alone; no excess lime in the slag is required; less metal is blown from the converter or carried in the slag. The possibility of using much colder irons is of great importance. For 1000 kg. of finished steel 1090 kg. of metallic charge including scrap and deoxidizers are required. Detailed blow sheet for all heats is given. JDG (12a)

The Coreless Induction Furnace in the Foundry. R. N. Blakeslee, Jr. *Fuels & Furnaces,* Vol. 10, July-Aug. 1932, pages 483-485. Installations and melting practice for ferrous and non-ferrous metals in several plants for cast products are briefly described. Ha (12a)

The Deoxidation Process in the Manufacture of Transformer Steel. (Ueber den Desoxydationsverlauf bei der Herstellung von Transformatorenstahl.) P. Bardenheuer & G. Thanheiser. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 15, 1932, pages 221-227. Tests made to determine deoxidation process show that time available for complete reaction and precipitation of deoxidation products greatly influences O-content of finished steel. The longer the time between deoxidation and pouring the lower was O-content and also watt-loss of the sheets. Ha (12a)

Deoxidation of Metals in the Foundry. R. Berger. *Foundry Trade Journal,* Vol. 47, Aug. 25th, 1932, page 115. Extended abstract of an article which appeared in *Das Metall,* Apr. 3, 1932. See "How Metal Castings are to be Deoxidized," *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 75. OWE (12a)

The Open-Hearth Furnace as a Means of Recovering Cast Iron from Borings. T. L. Joseph & C. E. Wood. *Transactions American Foundrymen's Association,* Vol. 3, Sept.-Oct. 1932, pages 266-272. Melting under slag and coke 90% of metal was recovered from charges of cast Fe borings in an experimental open-hearth furnace. CHL (12a)

Sulphur in Bessemer Irons. S. G. Afanassiev. *Domez,* No. 7, 1932, pages 28-32. (In Russian.) Analyses made on 16 ladles of Fe at blast furnace and at time of pouring them into mixer showed that during transportation of Fe to mixer its S content drops. Maximum drop observed was 27% of original. Intensity of S reduction depends on amount of it present originally and on lowering of temperature in transportation. Covering ladles with coal slack prevents desulphurization. In a mixer lined with 65% Si-32%Al_2O_3 brick S content increased above the original blast furnace analysis. (12a)

The Physical Chemistry of Steel Making: Deoxidation of Open-Hearth Steel with Manganese-Silicon Alloys. C. H. Herty, Jr., C. F. Christopher & M. W. Lightner. *Mining & Metallurgical Investigations, Mining & Metallurgical Advisory Board, Carnegie Institute of Technology Coöperative Bulletin* 58, 72 pages; *Mining & Metallurgical Advisory Board Progress Report,* 6th Open Meeting, Oct. 28, 1932, 22 pages. Includes discussion. Effect of open-hearth operations on physical properties of finished steel, in particular on impact value and age hardening, were investigated. Formation and identification of inclusions MnO-SiO_2-Al_2O_3, non-metallic inclusions in basic open-hearth slag, effect of deoxidation and furnace manipulation on physical properties of steel, were individual problems treated. They are described in detail; for results paper must be referred to. In general it can be said that inclusions do not affect dynamic properties of normalized steels unless an excessive segregation takes place, while "hardenability" is influenced by grain size. Definite methods of deoxidation with Si, added as Mn-Si, and of tapping were developed. Mn-efficiency increases with increasing amount of Si. 0.006-0.012% of P reverts to metal as Si addition increases from 0.07 to 0.11%, and about 0.003% of S is eliminated by fluxing action of fluid Mn-silicates formed on deoxidation. 22 references. Ha (12a)

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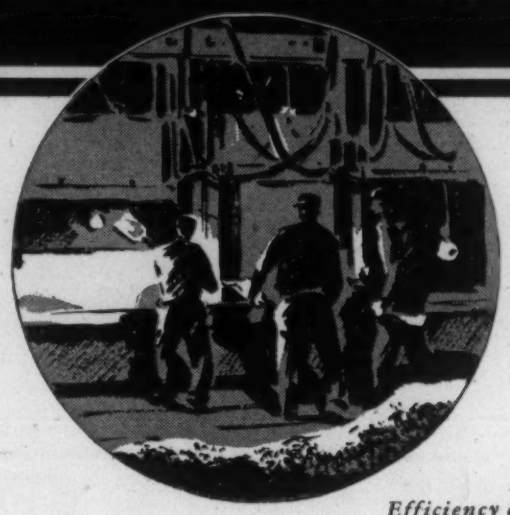

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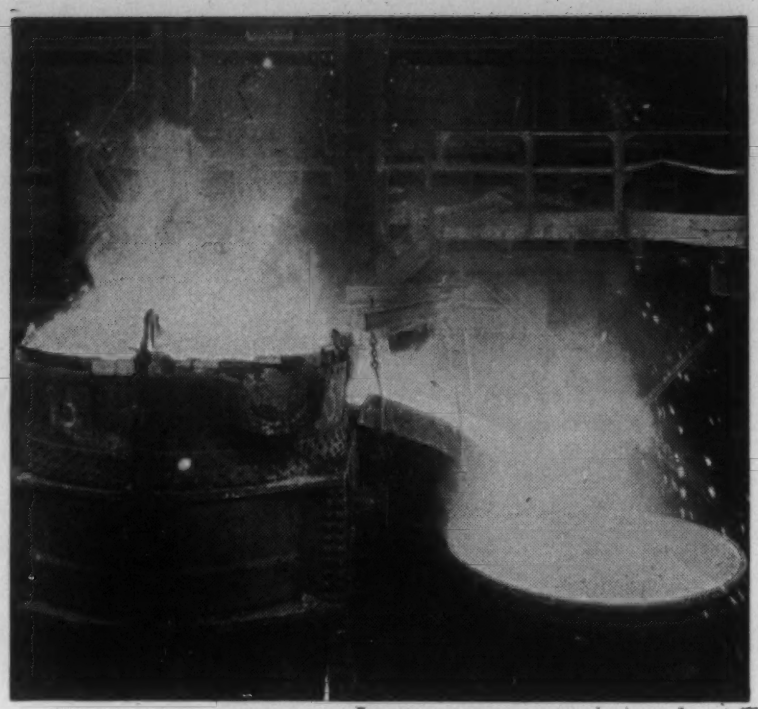

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Desulphurization and Superheating of Melt in Foundry Reverberatory Furnace. (Die Entschwefelung und Ueberhitzung der Schmelze in Giesserei-Schachtofen.) A. Achenbach. *Die Giesserei*, Vol. 19, Nov. 11, 1932, pages 453-458.
1 Present trends to cheapest possible production of cast Fe have often led to an injuriously high content of S in Fe due to use of too much scrap, with a high S content of foundry coke as contributing factor. Methods of desulphurization by additions of lime, by proper mixing of charge and coke are discussed and value of superheating melt explained. This requires more blast and it is shown how stack of furnace should be modified in order to obtain it. Ha (12a)

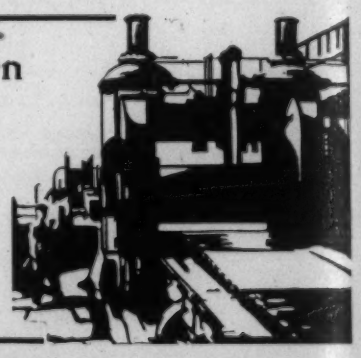
Investigations on an Apparatus for Measuring the Viscosity of Open Hearth Slags. (Untersuchungen zur Schaffung einer Einrichtung für die Messung der Viskosität von Siemens-Martin Schlacken.) Friedrich-Karl Buchholz. Doctor's thesis, Technische Hochschule Breslau, July 1932, 62 pages. After describing various methods for measuring viscosity and making tests with a preliminary apparatus for measuring viscosity of slags author developed an apparatus based on torsion principle according to Margules. New apparatus is described in detail. Experiments proved it to be most adaptable for above mentioned purpose. Apparatus was calibrated
2 with Pb, Cu, Hg, Na_2SO_4 and castor oil. Method is described to evaluate viscosity tests. Viscosity of a few open hearth slags was determined. 32 references. GN (12a)

Viscosities of Fluxes for Magnesium (Viscosités des flux et laitiers de fusion pour magnésium). Hardouin, Cochet & de Fleury. *Comptes Rendus*, Vol. 194, June 13, 1932, pages 2143-2144. The effect of fluxes for protecting molten Mg, on the quality of the alloys, on their resistance to corrosion, etc., is studied. Traces of chlorides cause corrosion and must be eliminated. Various systems—fluorides, fluorides and borates, borates and boric anhydride—have been studied. A suitable flux must be easily fusible and result in sufficiently viscous products to protect the material. A torsion viscosimeter for making these measurements of
3 viscosities is described. It is found that the viscosity is very sensitive to variations in composition. Some relative viscosities are given for systems $Na_2B_4O_7$-B_2O_3. OWE (12a)

Rolling (12c)

The Manufacture of Weldless Steel Tubes. V. Davies. *Mechanical World & Engineering Record*, Vol. 43, Jan. 6, 1933, pages 7-8. Raw material for manufacture of steel tubes by solid-drawn or weldless process is in form of solid cylindrical steel billets of various alloy steels, generally containing 0.22-0.39% C; 0.65-0.82% Mn; 0.235-0.254% Si; 0.022-0.04% P; 0.028-0.038% S. In billet-heating furnace described, usually pulverized-fuel is used, billets are heated
4 to about 1150° C. and brought to piercer mill and pilger mill both of which are fully discussed. Whole process, from time solid billet leaves furnace until it is a 40-ft. tube, takes from 7-15 min. depending on size. Kz (12c)

Keep Up With Modern Rolling Mill Practice
5 For cold rolling watch also Section 12j "Cold Working."
The Abstracts will help you



Chromium Plating Applied to Steel Mill Rolls. N. H. McKay. *Iron Age*, Vol. 130, July 7, 1932, pages 2-3; *Mechanical World & Engineering Record*,
6 Vol. 42, Sept. 16, 1932, page 266. Because of the hardness of Cr it has been possible, in certain cases to substitute Cr-plated forged steel rolls where tool steel rolls had previously been used. The plating has the further advantage of producing well-finished products in the case of cold-finishing strip mills. Ha + Kz (12c)

Fundamentals of Continuous Tube Rolling. G. B. Lobkowitz. *Rolling Mill Journal*, Vol. 7, No. 2, 1932, pages 98-106; *Blast Furnace & Steel Plant*, Vol. 20, July 1932, page 608; Aug. 1932, page 670; Sept. 1932, page 730 (abstract). Translation of article from *Stahl und Eisen*, Nov. 12, 1931 and Nov. 19, 1931. See *Metals & Alloys*, Vol. 3, July 1932, page MA220. MS (12c)

Roughing Passes and Arrangement of Passes for Stationary 3-High Rolls. (Vorwalzenkalibrierungen und Kaliberanordnungen auf festliegenden Triowalzen.)
7 Theo. Dahl. *Stahl und Eisen*, Vol. 52, Aug. 11, 1932, pages 779-783. Proper arrangement of passes can have a favorable influence on pressure in upper roll. These conditions were investigated and certain regularities in calibrating roughing passes and in arrangement of calibers of stationary 3 high rolls were found. Examples illustrate the calculations. 6 references. Ha (12c)

Roll Pass Design. Pt. XLI-XLII. W. Trinks. *Rolling Mill Journal*, Vol. 7, No. 2, 1932, pages 85-88, 92; No. 3, 1932, pages 133-135. Discusses cooling and rerolling of rails, and rolling of tie-plates, rail-joints, arch piling, complicated T-sections and shapes having sharp corners, double angles and opposing flanges. MS (12c)

8 **Roll Pressures and Power Requirements. Pt. I.** John A. Heiden. *Rolling Mill Journal*, Vol. 7, No. 3, 1932, pages 128-132. Develops theory that specific roll pressures can be compared correctly by means of a function designated "rate of reduction," expressed in "reduction units per second." "Rate of reduction" is equal to peripheral speed of roll (in./sec.) divided by final thickness (in.) and multiplied by relative reduction. It is equal to 1" reduction unit/sec. when speed of roll is 1"/sec., final thickness is 1/100" and relative reduction is 1/100. Discusses its practical application to curves for pressure and rate of reduction for .08-.10% C very mild steel rolled between smooth rolls. MS (12c)

Celoron Roll Neck Bearings. Arthur J. Schmitt. *Rolling Mill Journal*, Vol. 6, Jan. 1932, pages 17-18. Abstract of a paper read before the American
9 Society of Mechanical Engineers. See "Application of Impregnated Fabric Bearings to Roll Necks," *Metals & Alloys*, Vol. 4, May 1932, page MA 150. MS (12c)

Manufacturing Cold Rolled Stainless Strip Steel. F. L. Prentiss. *Iron Age*, Vol. 129, Mar. 31, 1932, pages 777-779, adv. pages 28, 30. Describes equipment and operation of stainless steel strip rolling plant of the Republic Steel Corp., Massillon, Ohio, which was put into operation recently. Practices in cold rolling stainless steel do not differ in general way from those followed in making cold rolled strip of plain C steel. The former is harder, and is harder on the mill than plain steel. However there are 2 differences. While plain C steel requires no heat treatment between hot rolling and first cold rolling the stainless steel is too hard to be cold rolled without first normalizing. VSP (12c)

10 **Modern Oil-Lubrication Methods as Applied to Rolling-Mill Equipment.** Jos. A. Merrill & Edwin M. May. *Transactions American Society of Mechanical Engineers*, Vol. 54, *Petroleum Mechanical Engineering*, Sept. 15, 1932, pages 75-82. The present methods of continuous lubrication and the improvements over former methods are discussed, oil-circulating systems and oil-conditioning practice and equipment described. Ha (12c)

Rolling & Forging (12c-d)

Structural Changes in Razor Blade Chrome Steel in Rolling and Forging. W. Zieler. *Iron Age*, Vol. 129, May 26, 1932, page 1157. Abstract translation of article in *Stahl und Eisen*, Jan. 14, 1932. See "Observations in the Forging and Rolling of Ledeburite Chromium Steels," *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 76. VSP (12c-d)

Forging (12d)

Forged High-pressure Drums. *Mechanical World & Engineering Record*, Vol. 42, Dec. 2, 1932, page 530. For years only high-pressure vessels of any size were big guns. Experience gained has been turned to good use in manufacture of boiler drums for super-power stations, and reaction vessels for certain chemical reactions. Article gives particulars of work which has been carried out by the English Steel Corporation Ltd. The largest forged boiler drum is 40 ft. long by 5 ft. 3 in. o.d. made from a 175 tons ingot. Kz (12d)

Machine Forgings. Fred. H. Colvin. *American Machinist*. Vol. 76, Dec. 21, 1932, pages 1213-1216. Examples are described showing that the increased accuracy of drop-forging and in the general art of forging make economies in machining and material possible. Ha (12d)

The Manufacture of Large Hollow Forgings. *Iron & Steel of Canada*, Vol. 16, Apr. 1933, pages 52-56. Describes production of large hollow forgings at the plant of Messrs. Thos. Firth and John Brown, Ltd., Sheffield. OWE (12d)

Cutting the Operating Cost of Forging Hammers. *Iron & Steel of Canada*, Vol. 15, Sept. 1932, pages 108-110. In certain forge shops compressed air will operate hammers more economically than steam. This article emphasizes importance of this fact in so far as Canadian forge shops are concerned, contentions being supported by reference to recent publications. OWE (12d)

Lake Erie Nut and Bolt Company. *Heat Treating & Forging*, Vol. 18, Nov. 1932, pages 658-660. Describes equipment and methods for hot working and heat treating. MS (12d)

Large Hollow-Forged Reaction Chamber. *Foundry Trade Journal*, Vol. 47, Nov. 10, 1932, page 284. Description of a large hollow-forged reaction chamber for use with a Dubbs cracking unit. 2 photographs are given. The production of so large a hollow forging is undoubtedly a great technical achievement. OWE (12d)

The World's Largest Hollow Forging. *Chemical Age*, London, Vol. 27, Dec. 3, 1932, Metallurgical Section, page 33. Charles Firth & John Brown, Ltd., Sheffield, Eng., have just completed the manufacture of the world's largest hollow forged reaction chamber for use with the Dubbs cracking unit owned by Trinidad Leaseholds, Ltd. Started with an ingot of 170 tons cast from 3 open hearth acid furnaces, the finished reaction chamber has an overall length just over 48 ft., an outside diameter of 78¾ in., inside diameter of 71¼ in., and its approximate weight is 66 tons. VVK (12d)

The Effect of Machine Rigidity on Metal Flow. E. R. Frost. *Iron & Steel of Canada*, Vol. 15, Nov. 1932, pages 137-139. By increasing the rigidity of forging machines it has been possible to forge parts to very close limits with the result that better surfaces, cleaner corners and edges, and increased strength are obtained. The need for machining is also reduced. OWE (12d)

Machining by Pressure. John H. Friedman. *Automobile Engineer*, Vol. 22, Nov. 1932, pages 559-560. Abstract of paper before Society of Automotive Engineers. See *Metals & Alloys*, Vol. 3, May 1932, page MA 137. RHP (12d)

These Abstracts will keep you informed On Forging

Cadillac Connecting Rods Made by New Forging Process. L. A. Danse. *Iron Age*, Vol. 129, Apr. 14, 1932, pages 869-871. Even flow lines in the finished forging constituted the goal to be achieved. The new method of gently squeezing the metal down in rolls resulted in straight, even flow lines. The final line-up gave minimum flash and still higher physical properties in fatigue, due to elimination of excess flash and its accompanying "squirt" from web out through flanges into the flash. Rods are heat treated in a special single-purpose furnace. Heating curve followed in heating for quenching is an ideal curve and was developed experimentally by adjustment of electric heating elements and controls so as to give optimum of heating conditions. Pickled rods are cleaned by sand blasting. Material used for rods is S.A.E. 4140 electric furnace steel. VSP (12d)

A 1,200 Capacity High-duty Forging Machine. E. Grund. *Engineering Progress*, Vol. 13, June 1932, pages 131-132. Illustrates and describes a forging machine manufactured by Schiess-Defries A. G. Dusseldorf. RHP (12d)

Forging Dies for Truck or Bus Front Axles. E. Tonkin. *Heat Treating & Forging*, Vol. 17, Dec. 1931, pages 1121-1123, 1153. Discusses preparation of forging dies for automobile axles. Ha (12d)

Condition of Dies Affects Forgeability. Correspondence from F. W. Spencer. *Metal Progress*, Vol. 22, Nov. 1932, pages 44-45. Refers to article by O. W. Ellis in Sept. *Metal Progress* on Forgeability of Steel. The condition of anvil or pallet faces is important in comparison tests between drop hammer and friction screw press. WLC (12d)

Machine and Other Forging Methods. F. W. Spencer. *Heat Treating & Forging*, Vol. 18, Dec. 1932, pages 689-691, 698. Lecture before the Coventry Engineering Society. Somewhat elementary description of forging processes. MS (12d)

Hot Brass Pressings. J. Willis Beard. *Metal Industry*, London, Vol. 41, Dec. 9, 1932, pages 563-564; Dec. 16, 1932, pages 591-592, 597; *Machinery*, London, Vol. 41, Dec. 1, 1932, pages 249-252. A practical explanation of methods and operations employed in production of hot brass pressings which often have great advantages over castings. Metals used for this process are preferably forging quality brass (58-60% Cu, up to 2% Pb, remainder Zn), Mn-bronze (58% Cu, up to 1% Mn, 0.1% Fe, balance Zn), naval brass and some special alloys. Pressings have a higher tensile strength than die-castings. Equipment is described. Kz + Ha (12d)

Forging Presses. Eugen Reinecke. *Engineering Progress*, Vol. 13, Mar. 1932, pages 70-72. Description of presses manufactured by Henry Pels & Co. A.G., Berlin. Frame is made of open-hearth plates instead of castings, giving frame great rigidity. Gives a detailed description of press, its operation and special features. RHP (12d)

Ford Axles Are Press Forged and Pickled Continuously. E. F. Ross. *Steel*, Vol. 91, July 18, 1932, pages 25-27, 34. Fourth article. A description of automatic methods used in forging, heat-treating, handling and pickling of front axles for Ford automobile. An extrusion process for producing special types of forgings is also described as well as a number of smaller forging assemblies. JN (12d)

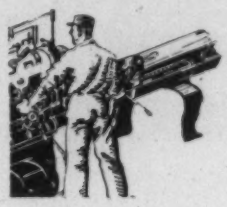
Machining (12g)

On a New Tool Dynamometer for Machine Tools. Yaekichi Sekiguchi & Ichiro Hasegawa. *Journal Society of Mechanical Engineers*, Tokyo, Vol. 35, Sept. 1932, pages 914-923. Paper read before 2nd General Meeting of the Society of Mechanical Engineers, Apr. 7, 1932. A new tool dynamometer devised by the authors is described. Results of experiments carried out on various materials with different combinations of feeds and cutting depths are reported. Kz (12g)

Machining "Wasp" and "Hornet" Crank Shafts. H. R. Simonds. *Iron Age*, Vol. 129, Jan. 28, 1932, pages 280-283. Extreme precision is required in production of crankshaft which presents an interesting machining and assembling problem. Describes procedure at Pratt & Whitney Aircraft Co. VSP (12g)

Drill Testing. I. F. Klokov. *Machine Tools & Instruments*, Feb. 1933, pages 6-14. (In Russian). Comprehensive tests were made on the cutting properties of domestic and foreign twist drills. All drills of Russian manufacture were far inferior to the foreign made on account of improper heat treatment. (12g)

Standardization of Jig and Fixture Parts. P. Grodzinski. *American Machinist*, Vol. 76, Aug. 31, 1932, pages 961-963. Reviewing work done in German standardization author recommends steps in same direction to the American industry laying down principles which should be applied for standardization of implements, fixtures, etc. Ha (12g)



Have You a Machining Problem?

The answer may be here.

On the Question of the Constitution of High Speed Tool Steel. The Effect of Pouring and Forging Temperatures on the Properties of High Speed Tool Steel. N. T. Goodtzoff & S. A. Kazeieff. *Reprint* (1930) from *Metallurgist*, Russia, 1929, 32 pages. Crucible heats of high speed steel containing about 0.67% C, 0.60% Si, 0.20-0.35% Mn, 0.007-0.013% S, 0.020-0.034% P, 4.25% Cr, 18.8-19.4% W (no V) were cast in 220 lb. ingots at 1640° and 1520° C. and forged at 1175° C. after preheating 4 hours at 800° C. to 90 x 90 mm. bars. These were forged to 40 x 40 mm., starting at 1150° and finishing at 900° C. Further forging to 30 x 40 mm. or to 16 x 25 mm. was done from starting temperatures of 1150° or 1200° C., finishing at various temperatures down to 900° C. Round nosed lathe tools for roughing cuts of a form suggested by Taylor were rough ground, heated slowly to 800° C., then rapidly to 1300° C., oil quenched and finish ground. They were apparently not tempered, but used as quenched. Lathe breakdown tests were made under roughing cuts on a large lathe, the material being cut being a quenched and tempered 0.37% C, 0.90% Cr steel of 80 kg./mm.^{2} tensile (114000 lbs./in.^{2}), 14% elongation, 31% reduction of area, 2 m. long and 800 mm. initial diameter. No data are given to show whether this large test log varied in properties as the exterior was turned off. The microstructure resulting from the variations in pouring and forging temperatures is discussed at length as is the relation of undissolved carbides to the appearance of the fracture. Primary carbides in the center of the grains as cast are not dissolved at temperatures below the melting point, the authors think. They may be broken up in forging, but may again agglomerate on heating at 1250° C. for a long time. Lathe tests, in which but 3 tools were tested for each pouring temperature were interpreted by the authors as showing better cutting efficiency for the steel cast at the higher temperature, but the differences are within the usual range of experimental error in such tests. More extended lathe tests were made on tools cast from the lower temperature but with different starting and finishing temperatures in the final forging operation. The curves for these tests show rather large differences, from which it is concluded that a high starting temperature and low finishing temperature of forging lead to best cutting efficiency. HWG (12g)

Coloring (12m)

Colored Finishes on Zinc—The Lacquering and Enameling of Rolled Zinc and Zinc Die Castings. *Brass World*, Vol. 28, Nov. 1932, pages 224-225. Cleaning of metal surface, mechanical and chemical roughening of surface, and baked, brushed, sprayed or dipped coatings are briefly discussed. WHB (12m)

How to Make Copper Tubes in Boiler and Engine Rooms a Reddish Color. (Wie erhalten in Kessel- und Maschinenräumen verlegte Kupferrohre ihre rötliche Naturfarbe?) *Feuerungstechnik*, Vol. 20, May 1932, page 77. To prevent corrosion or to dispense with continuous polishing following means are advised: (1) heating with moderate air supply; (2) storing in water and pressing of finely distributed air into bottom of tank; (3) application of 10% hot KOH + 20% hot Rochelle salts solution and dipping of Cu objects into boiling mixture. After 3 min. a sugar solution is added which reduces alkaline Cu hydroxide to a flaming red lower metal oxide. In moist rooms, red oxide is liable to change to black oxide and basic carbonate. To prevent this, utilization of an invisible cellulose lacquer or high-melting, colorless hard-paraffine is advised. EF (12m)

Coloring and Oxidizing of Noble Metals. (Das Färben und Oxydieren von Edelmetallen.) Rechenberg. *Metallwaren Industrie und Galvano-Technik*, Vol. 30, Feb. 1, 1932, pages 57-58. Practical hints on baths for coloring of Au and Ag ware. EF (12m)

Investigations with Potassium-Permanganate Stains. (Untersuchungen über Kaliumpermanganatbeizen.) H. Krause. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle*, Vol. 6, Oct. 1932, pages 64-67. Experiments made to determine whether the Cu sulphate used with potassium permanganate for brown-coloring of Cu and Cu alloys could be replaced by other salts of Cu or other metals are described, but were negative as no other substance gave same coloring. Ha (12m)

Sand Blasting (12n)

Sheet Steel Cleaning By Abrasive Blast. L. D. Peck. *Iron Age*, Vol. 129, Mar. 10, 1932, pages 615-617. It is not believed that abrasive blast cleaning will entirely supplant pickling. Comparative tests made. Describes a newly designed rotary gun operated at high speed. Blast method is useful in removing large scale prior to pickling. VSP (12n)

Modern Sand Blast Apparatus. (Ein modernes Sandstrahlgebläse.) Gustav Krebs. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 27, 1932, pages 469-471. Author first gives an account of various principles underlying sand blast apparatus. Former types of apparatus either with compressive or sucking action are discussed. 2 new types of sand blast apparatus with either 2 or 4 rotating nozzles, working on compressed air, marketed by Alfred Gutmann, Aktienges. für Maschinenbau, Altona-Ottensen, Germany, are described in detail. Both types possess a high efficiency. GN (12n)

ECONOMIC (16)

Magnesium and Its Compounds in 1931. P. M. Tyler. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part II, Feb. 24, 1933, pages 263-277. Quantity of Mg ingot sold or used by producer in 1931 (580,463 lbs.) increased 3.7% over 1930 and exceeded all previous years except 1929. Sales for deoxidizing purposes declined greatly, reflecting low activity in brass, bronze, and Ni foundries. Sales of ribbon and wire dropped with lower demand from manufacturers of radio tubes (7,898 to 2,906 lbs.). Sales of Mg powder dropped from 30,832 to 23,924 lbs. due to the increased popularity of the photoflash bulb and to smaller consumption in shells. Sales of alloys and castings increased, alloys from 12,297 to 65,314 lbs. and castings from 99,443 to 127,398 lbs. Sales of sheet increased from 1,348 to 9,433 lbs. The main gains in new sales tonnage have been in the replacement of Al and bronze parts of envelope-folding machines, cigarette machines, power sewing machines, bread slicers, and portable tools and meters. The latest addition to Mg alloys is Dowmetal G, 10% Al, 0.1% Mn, and the rest Mg. A new flux for acetylene welding has been introduced. AHE (16)

The Present Status of the Mineral Industry. Scott Turner. *United States Bureau of Mines, Information Circular* 6682, Jan. 1933, 4 pages. Present output of minerals and their values are compared with averages for preceding 5 years. Consumption trends are briefly discussed. AHE (16)

Molybdenum. P. M. Tyler & A. V. Petar. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Nov. 14, 1932, pages 75-80. Production of Mo concentrate in U. S. in 1931 was 3000 tons of concentrates containing 85.93% MoS_2, compared with 3618 tons containing 85.75% MoS_2 in 1930. 1931 output was more than average for 1926 to 1930. Three companies (2 in the U. S.) produce all but 2 or 3% of the world's Mo. AHE (16)

Italian Foundry Industry in 1932. Guido Vanzetti. *Foundry Trade Journal,* Vol. 48, Jan. 19, 1932, pages 42, 62. Mentions progress in light-alloy production, melting plants and mechanization of foundries. OWE (16)

Vanadium, Uranium and Radium in 1931. F. L. Hess. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Dec. 14, 1932, pages 185-190. Demand for V, U and Ra declined in 1931. Company activities are noted. Production figures can not be given. Production abroad is discussed. AHE (16)

Molybdenum Industry in 1932—Advance Summary. Frank L. Hess & H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 196, May 2, 1933, 2 pages. In 1932, 363,400 short tons of Mo ore was produced and yielded 2,616 tons of concentrate carrying 85.21% or 4,458,000 lbs. MoS_2, equivalent to 2,675,000 lbs. Mo as compared with 3,132,700 lbs. in 1931. AHE (16)

Ratio of Automotive Use of Steel Gains in 1932. William Crawford Hirsch. *Automotive Industries,* Vol. 68, Jan. 28, 1933, pages 93-94. Brief discussion of use, production and price fluctuations of steel and non-ferrous metals in 1932. DTR (16)

The Situation of German Iron Foundries in 1932. Th. Geilenkirchen. *Foundry Trade Journal,* Vol. 48, Jan. 26, 1933, pages 77-78. A brief survey of economic conditions and effect of price- cutting and political programs. OWE (16)

Gold, Silver, Copper, Lead and Zinc in Idaho in 1931. C. N. Gerry & T. H. Miller. *United States Bureau of Mines, Mineral Resources of the United States,* 1931, part 1, Apr. 25, 1933, pages 437-466. The value of the mine production of Au, Ag, Cu, Pb and Zn in Id. decreased from $21,494,867 in 1930 to $11,418,013 in 1931, the smallest since records were started in 1903. Au production was $379,563, a decrease of more than 14% from 1930. Ag output was 7,220,923 oz., compared with 9,420,639 oz. in 1930. Cu production was 1,144,915 lbs., a decrease from 3,111,555 lbs. in 1930. Pb output declined 26% in quantity to 198,729,228 lbs. Zn production was 39,137,212 lbs., 48% less than 1930. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Arizona in 1931. C. N. Gerry & T. H. Miller. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Feb. 28, 1933, pages 377-415. In 1931, mines of Arizona produced Au, Ag, Cu, and Pb, valued at $40,144,694, a decrease of more than 50% from 1930 and 74% from 1929. This, however, was a larger metal output than any other state. Copper represents 91% of the total value. Au production was $2,608,495, a decrease of 25% from 1930, and the lowest since 1908. Ag output declined 41% to 3,245,311 oz., and 56% in value to $941,140. Cu output was 401,344,909 lbs., a decrease of 30% from 1930, worth $36,522,387. Pb production decreased from 8,491,623 lbs. in 1930 to 1,964,112 lbs. in 1931, the smallest output since 1904, valued at $72,672. No Zn was produced in Ariz. in 1931. AHE (16)

Gold, Silver, Copper, Lead and Zinc in Washington in 1931. C. N. Gerry & T. H. Miller. *United States Bureau of Mines, Mineral Resources of the United States, 1931,* Part 1, Apr. 25, 1933, pages 467-478. The value of mine production of Au, Ag, Cu, Pb and Zn in Washington increased more than 62%, from $348,630 in 1930 to $565,498 in 1931. Au production decreased from 4,244.81 oz. to 2,904.19 oz. while Ag output was less than any yr. since 1894, falling from 32,816 oz. in 1930 to 22,410 oz. in 1931. Cu production decreased 83% from 1930 to 202,503 oz. in 1931. Production of Pb in 1931 was 2,771,116 lbs., nearly 2½ times that in 1930. Zn output was 703,782 lbs. in 1930 and increased to 9,947,495 lbs. in 1931. AHE (16)

Possibilities of Economic Gold Production in Hohen Tauern with Special Consideration of Results Obtained so Far in Nassfeld Region. (Die Möglichkeiten der wirtschaftlichen Goldgewinnung in den Hohen Tauern unter besonderer Berücksichtigung der bisher am Nassfeld erzielten Ergebnisse.) R. Eichelter. *Montanistische Rundschau,* Vol. 25, May 1, 1933, pages 1-16. Possibilities of producing gold economically in the above mentioned Austrian district are critically considered. GN (16)

The Belgian Steel-Foundry Industry in 1932. G. Fosseprez. *Foundry Trade Journal,* Vol. 48, Jan. 19, 1933, pages 49-50. Short note emphasizing critical condition of steel foundries in Belgium. OWE (16)

Magnesium Industry in 1932—Advance Summary. A. E. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 193, Apr. 21, 1933, 1 page. In 1932, 791,699 lbs. of Mg ingot was sold or used, an increase of 36.3% in quantity over 1931. Total imports were 935 lbs. AHE (16)

Casting in A Russian Foundry. P. Fox-Allin. *Foundry Trade Journal,* Vol. 47, Dec. 8, 1932, page 358. Summary of cost system applied in foundry of Leningrad, Baltic Shipyard. OWE (16)

Industrial Russia of 1932. Percy Fox-Allin. *Foundry Trade Journal,* Vol. 47, Oct. 27, 1932, pages 247, 260; Dec. 1, 1932, pages 340-341. An outline of recent developments of iron and steel works in Soviet Russia. Author considers that uneconomic haste has been exhibited in many directions. Developments in the Urals are sketched, as well as those in Ukraine which are less advanced. Automobile, tractor and locomotive plants are described, though same are not yet completed. OWE (16)

Platinum and Allied Metals in 1931. H. W. Davis. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Nov. 14, 1932, pages 89-101. See *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 80. AHE (16)

Gold, Silver, Copper, Lead and Zinc in New Mexico in 1931. C. W. Henderson. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Jan. 20, 1933, pages 297-313. Value of Au, Ag, Cu, Pb, and Zn recovered in New Mexico in 1931 was $9,494,766, a decrease of 31% from 1930. Au decreased from $669,156 in 1930 to $644,160. Ag decreased slightly in amount from 1,107,335 oz. to 1,041,859 oz., and in value from $426,324 to $302,139. Cu output was 61,503,100 lbs. worth $5,596,782, as compared with 65,150,000 lbs. worth $8,469,500 in 1930. Pb production increased from 20,756,900 lbs. to 22,537,000 lbs., but the value decreased from $1,037,845 to $833,869. Zn output was 55,732,000 lbs., valued at $2,117,816 in 1931, 65,529,000 lbs. worth $3,145,392 in 1930. AHE (16)

The Mineral Resources of the Bushveld. A. L. Hall. *South African Mining & Engineering Journal,* Vol. 43, Part 2, Oct. 22, 1932, pages 113-114. Occurrences of W, Mo, Cr, Fe, Ni, Co, Bi and As are described. AHE (16)

American Foundry Industry Seeks Way Out of Difficulties During 1932. C. E. Hoyt. *Foundry Trade Journal,* Vol. 48, Jan. 19, 1933, pages 54-55. Discusses economy programs, costs and price cutting. OWE (16)

Economic Problems of the German Iron Foundries. (Moderne Wirtschaftsfragen der Deutschen Eisengiesserein.) H. Stewens. Doctor thesis, University of Köln, 1931, 88 pages. Statistics of production, labor required, prices, etc. 1913-1930. Point of view taken is the economic one, metallurgical angles not being considered. 18 local or special trade associations of from 5 to 33 members for price-fixing purposes are listed. Verein deutscher Eisengiesserein is attempting to link together all the groups and individual foundries, and to put in uniform cost accounting methods. It is stated that "no competition is so much to be feared as that of those who do not calculate their costs." HWG (16)

Chromite in 1931. L. A. Smith. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Dec. 19, 1932, pages 103-116. World production of chromite in 1931 decreased about 1/3. Exports from the main producing countries dropped about 46%. The U. S. imported about 213,000 long tons, a decrease of nearly 35%, in spite of a 50% cut in price. In the U S. 762 long tons of chromite were mined, all in Calif., an increase from 310 tons in 1930. Uses are discussed. AHE (16)

Metal Mining in Oregon, 1932—Advance Summary. V. C. Heikes. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 175, Jan. 23, 1933, 2 pages. Total value of Au, Ag, Cu, Pb and Zn produced in Oregon in 1932 was $439,020, an increase of $119,317 over 1931. Au was the chief metal, $434,110. Ag was incidental to the Au, and amounted to $2,550 ($2,104 in 1931). Cu output increased from 1700 lbs. to 29,500 lbs., valued at $1,800. Pb increased from 3497 lbs. to 6700 lbs., worth $190. Zn production was 12,000 lbs., value $370; none was reported in 1931. AHE (16)

Gold, Silver and Lead in South Dakota in 1931. C. W. Henderson. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Dec. 22, 1932, pages 227-235. Au output increased from $8,418,008 in 1930 to $8,931,791 in 1931; Ag from 105,236 oz. to 113,562 oz., although its value decreased from $40,516 to $32,933. No Pb was produced. AHE (16)

Metal Mining in South Dakota, 1932—Advance Summary. Chas. W. Henderson. *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 165, Jan. 13, 1933, 1 page. Production of mines in S. Dak. in 1932 was Au $9,959,711 and Ag 126,095 oz., increases from Au $8,931,791 and Ag 113,562 oz. in 1931. AHE (16)

Gold, Silver, Copper and Lead in Texas in 1931. C. W. Henderson. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Jan. 20, 1933, pages 315-316. There was no production of Au, Ag, Cu, and Pb in Texas in 1931. AHE (16)

Gold and Silver in 1932. Chas. W. Henderson & J. P. Dunlop. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 198, Apr. 29, 1933, 17 pages. World Au production in 1932 was approximately 22,500,000 oz.; Ag about 160,000,000 oz. In the U. S. the output was Au $51,836,000 and Ag 24,425,000 oz. Figures are given by countries and by states. AHE (16)

Ore Concentration Statistics in 1931. Metallurgical Results and Flotation Reagents. T. H. Miller & R. L. Kidd. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Apr. 12, 1933, pages 417-436; *United States Bureau of Mines, Mineral Market Reports,* No. M.M.S. 174, Jan. 17, 1933, 4 pages. In 1931, nearly 83% of the nonferrous ore mined in the U. S. was treated by concentration at plants using flotation. 3.83% was shipped direct to smelters, 6.26% was treated at Au and Ag mills and 6.66 was treated at miscellaneous plants, including Cu leaching and magnetic separating plants. Of the total, 60.98% was treated by straight flotation, 38.61% by combined gravity and flotation concentration and 0.41% by straight gravity concentration. Pine oils and cresylic acid continued to be the chief frothing reagents. In 1931, pine oils accounted for about 60% of the 5,507,768 lbs. of frothers used. Coal-tar creosotes continued to be the chief collecting reagent and blast-furnace oils the second in the distillation products group. There was a marked reduction in the consumption of wood-tar creosotes. Xanthates continued to be the chief synthetic collectors, amounting to 6 times the amount of coal-tar creosotes and to 70% of the 4,295,744 lbs. of collectors used. Over 11 million lbs. of H_2SO_4 were used at the rate of 21.342 lbs./ton of ore. Lime was the major alkali, 112,897,662 lbs. being consumed. Among the other inorganic reagents, were 642,815 lbs. of Na_2S for sulphidizing, 3,324,908 lbs. of $CuSO_4$ for activating, 2,258,275 lbs. of depressing agents including 1,018,803 lbs. of $ZnSO_4$. Starch was reported for the first time. The consumption of reagents and metallurgical results for each type of ore are discussed. AHE (16)

The British Steel Foundry Industry in 1932. W. B. Lake. *Foundry Trade Journal,* Vol. 48, Jan. 19, 1933, page 41. Short note, including production figures for United Kingdom for first eleven months of 1932. OWE (16)

Gold in Manitoba. A. J. McLaren. *Transactions Canadian Institute of Mining & Metallurgy,* 1932, pages 417-433. Au ranks second to Cu in Manitoba. AHE (16)

Tin in 1931. C. W. Merrill. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Jan. 1933, pages 331-349. World Sn production in 1931 was 146,000 long tons, 16% decrease from 1930. The Federated Malay States produced 35% of the world output, Bolivia 21%, and Netherland East Indies 19%. Straits Settlements, United Kingdom, and Netherland East Indies smelted 90% of the world's output. Domestic Sn production was 3.7 long tons. Secondary Sn recovery declined 24% from 1930 to 17,678 long tons, equivalent to 27% of the virgin Sn imported. AHE (16)

Zinc Industry in 1932—Advance Summary. H. M. Meyer. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 184, Mar. 8, 1933, 3 pages. Production of metallic Zn at Zn reduction plants in the U. S. in 1932 was 221,866 short tons, valued at $13,312,000, declines of 29% and 44%, respectively. Of the total, 23,208 tons was electrolytic. Ill. was the leading producer (67,607 tons) and increased her output over 1931; Pa. was second. AHE (16)

Copper Industry in 1932—Advance Summary. H. M. Meyer. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 203, May 20, 1933, 5 pages. Smelter output from domestic sources (544,009,948 lbs.) decreased 48% and refinery primary production from domestic and foreign sources (680,867,734 lbs.) declined 55% from 1931. The av. price of Cu (6.3 cents) declined 31%, making the value of smelter production 64% below 1931. Stocks (1,004,000,000 lbs.) increased 9%. Imports (391,991,342 lbs.) declined 33%; exports (295,356,719 lbs.) fell off 47%. AHE (16)

Lead Industry in 1932—Advance Summary. H. M. Meyer. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 190, Apr. 19, 1933, 3 pages. Output of refined primary Pb in the U. S. from domestic ore in 1932 was 255,337 short tons, a decrease of 35% from 1931, valued at $15,320,000, a decline of 47%. The production from foreign ores was 33,024 tons, a decrease of 37%. About 31% of the Pb from domestic ores was from Mo., 27% from Utah, and nearly 27% from Id., as compared with 38%, 19% and 26% respectively, in 1931. Antimonial Pb produced at primary smelters in 1932 was 21,024 tons, containing 3577 tons of primary domestic Pb, 1466 tons of primary foreign Pb, 878 tons of primary domestic Sb, 207 tons of primary foreign Sb, 13,486 tons of secondary Pb and 1410 tons of secondary Sb. AHE (16)

Rolled Zinc in 1932—Advance Summary. H. M. Meyer. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 195, Apr. 25, 1933, 1 page. The output of rolled Zn in 1932 amounted to 95,594,938 lbs., a decrease of 18% from 1931. AHE (16)

The Pig-Iron Industry in 1932. A. C. MacDiarmid. *Foundry Trade Industry*, Vol. 48, Jan. 19, 1933, page 60. Gives tables of trade balance, of production, and of exports for 1913 and 1928-1932. OWE (16)

The Copper Situation. Arthur Notman. *Transactions Canadian Institute of Mining & Metallurgy*, 1932, pages 353-367. A general discussion. AHE (16)

Lead and Zinc in 1932. O. W. Roskill. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, pages 11-12. World production of Zn was 788,000 tons in 1932, as compared with over 1,000,000 tons in 1931. Stocks were decreased. World output of Pb was 1,266,000 tons, 135,000 tons less than 1931, but stocks increased to 500,000 tons. AHE (16)

Is Electrical Melting Economical? (Ist das elektrische Schmelzen wirtschaftlich?) E. Fr. Russ. *Elektrowärme*, Vol. 3, Feb. 1933, pages 32-33. Of all steel produced about 2-3% are melted electrically, mostly high quality steel. Of the non-ferrous metals brass and Al are more and more melted in electrical furnaces as the advantages, especially in lesser burning losses and saving in refractories as compared with other fuels, become more widely recognized. It is pointed out that by utilizing special off-time rates for electrical energy the electric melting furnace will have a great future in the metal industry. Ha (16)

Zinc in 1931. E. W. Pehrson. *United States Bureau of Mines, Mineral Resources of United States, 1931*, Part 1, Jan. 16, 1933, pages 265-296. In 1931, 291,996 short tons of primary Zn was produced, all from domestic ores, in contrast with 498,045 tons in 1930. World smelter production was 1,116,000 short tons. AHE (16)

Manganese and Manganiferous Ores in 1931. R. H. Ridgway. *United States Bureau of Mines, Mineral Resources of United States, 1931*, Part 1, Dec. 20, 1932, pages 153-184. Domestic mines shipped 39,242 long tons of Mn ore with more than 35% Mn (67,035 tons in 1930). Shipments of ferruginous Mn ore were 64,062 tons (77,417 tons in 1930), and of manganiferous Fe ore were 217,352 tons (707,973 tons in 1930). Production of ferro Mn decreased from 274,830 tons in 1930 to 166,937 tons in 1931 of spiegeleisen from 87,059 to 67,800. Imports of Mn ore were 502,518 tons (585,568 tons in 1930). Stocks increased. AHE (16)

Gold in 1932. E. Baliol Scott. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, pages 1-2. World output of Au in 1932 is estimated as 23,766,081 oz., an increase of more than 1,500,000 oz. over 1931 and a record production. AHE (16)

Tin in 1932. E. Baliol Scott. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, pages 7-8. Sn output for 1932 is estimated at 96,000 tons. Among 5 countries operating on a quota, production declined 42% from 1931. AHE (16)

Copper, Lead and Zinc Mining in 1932—Advance Summary. O. E. Kiessling. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 173, Jan. 21, 1933, 3 pages. Smelter production of Cu from domestic ores in 1932 was 264,000 short tons and refinery production from domestic and foreign ores 344,000 tons. The output of recoverable Cu by domestic mines in 1932 was 241,580 tons, 54% below that for 1931. All the important states recorded decreases of 50% or more. Output of primary refined Pb from domestic sources in 1932 was 254,000 tons and from foreign sources 33,000 tons. Recoverable Pb in ore mined in the U. S. in 1932 was 290,850 tons, about 28% below 1931. Missouri was the leading producer. Smelter output of primary Zn from domestic ores was 207,000 tons. The recoverable Zn in ores mined in the U. S. in 1932 was 283,580 tons, 31% below 1931. New Jersey produced 29% of the total. Figures are given by states. AHE (16)

Mineral Production of the World, 1924-1929. L. M. Jones. *United States Bureau of Mines, Mineral Resources of United States, 1930*, Part 1, Nov. 15, 1932, pages 859-962. A comprehensive statement of mineral production of world for 1924 to 1929 is given by countries from Aden and Afghanistan to Yugoslavia and Zanzibar. AHE (16)

The Nationality of Commercial Control of World Minerals. W. P. Rawles, Secretary, The Mineral Inquiry. *Contribution* No. 41, *American Institute of Mining & Metallurgical Engineers*, 1933. 9" x 6", 44 pages. Price to non-members of the A.I.M.E. 75c. The "Mineral Inquiry" is organized by the A.I.M.E. to make factual studies of the mineral resources of the U. S. and the world in their political and international relations. The pamphlet discusses concisely in text and tables, the geographical location and nationality of control of the commercial supplies of Al, Cr, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Ag, Sn, W, V and Zn, as well as of nitrates, oil, potash and sulphur. H. W. Gillet (16) -B-

Lead in 1931. E. W. Pehrson. *United States Bureau of Mines, Mineral Resources of United States, 1931*, Part 1, Feb. 24, 1933, pages 351-375. In U. S., production of refined primary Pb from domestic ores declined 32% to 390,260 short tons and that from foreign ores and base bullion 24% to 52,504 short tons. Recovery of secondary Pb in pig Pb and alloys declined only 8% to 234,700 tons. This was equivalent to 60% of domestic production of refined primary Pb. Consumption of Pb declined 26% from 1930 and 42% from 1929. Cable covering and building showed greatest decline; former 44% and latter 41%. Use of Pb in storage batteries declined only 4% and became chief use; white Pb was third in importance and declined only 8%; cable coverings were second and building fourth. Ammunition declined 11% to fifth place. Stocks increased from 103,000 to 151,000 tons. Imports of base bullion decreased 16% and of Pb in ore and matte declined 47%. Exports declined 55%. Mine production declined 29% and was the lowest since 1910. Mo., Id., and Utah contributed 84% of the total but declined 20, 26 and 31% respectively. World smelter production was 1,555,000 short tons, 16% less than in 1930. The U. S. produced 27%, as compared with 33% in 1930. Smelter production declined 32% in the U. S., and only 7% elsewhere. AHE (16)

Refractories in 1932. Frank S. Russell. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, page 42. Effect of the protective tariff on the manufacture of refractories is noted (no figures). OWE (16)

The Light-Castings Industry in 1932. W. R. Blair. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 48-49. Summarizes figures for export trade during 1932 and some previous years, and discusses price stabilization scheme. OWE (16)

Comparative Cost of Production of Cast Iron by Coke-Oven vs. Electric-Furnace Reheating. (Contributo allo studio camparativo dei costi di produzione della ghisa di refusione al cubilotto ed al forno ellettrico.) P. L. Tagliaferri. *La Metallurgia Italiana*, Vol. 25, Feb. 1933, pages 73-90; *Journal du Four Electrique*, Vol. 42, Feb. 1933, pages 57-60. It is shown that it is possible to use electrical energy rather than coke, providing the cost of electrical energy remains fairly low. Its use results in improved products, and utilizes a national product, electricity, rather than coke, which is imported. JDG + AWC (16)

Mining Industry in Spain in 1932. (La Industria Minera en Espana en 1932.) Luis Barreiro. *Revista Minera*, Vol. 84, Feb. 8, 1933, pages 65-66. Production, consumption, and exports of Fe in Spain for years 1913, 1929-1932 are itemized. For 1932 production showed a marked drop from that of 1913, 1,847,000 tons for 1932 as against 9,862,000 tons for 1913. England and Germany consumed most of Spain's Fe exports. DTR (16)

Considerations on Cost Calculation in Iron Foundry. (Betrachtungen über die Selbstkostenberechnung in der Eisengiesserei.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Apr. 30, 1933, pages 173-175. Description of a scheme to calculate production costs in Fe foundries. GN (16)

The Malleable Industry Since 1900 and Its Present Condition. W. R. Bean. *Iron Age*, Vol. 130, Sept. 8, 1932, pages 370-396. Review of condition in the malleable industry since 1900. Suggests dismantling 137 of the total of 139 malleable foundries. Author claims that assuming normal annual demand of 900,000 tons of castings, 2 foundries are capable of producing 1/6th of tonnage which leaves 5/6th for division among 137. Competition in last 10 years has been ruinous. VSP (16)

Trade Barriers Cut America's Share of World Motor Markets. C. F. Baldwin. *Automotive Industries*, Vol. 68, June 3, 1933, pages 680-681. Production in U. S. and Canada amounted to only 72.4% of world total in 1932 as compared with 88.3% in 1929. The writer blames the trade barriers as the cause for the large decline. DTR (16)

Non-Ferrous Metals in Australia. C. L. Blazey. *Metal Industry*, London, Vol. 42, Jan. 27, 1933, pages 121-124. Statistical review of deposits, plants and productions of Pb, Zn, Cu, Sn, Au and Ag in Australia; Ag takes the first place with 9,854,571 oz., and Pb with 163,296 tons is the principal non-ferrous base metal. Ha (16)

Foundry Costing. Alex. Young. *Foundry Trade Journal*, Vol. 48, Feb. 2, 1933, pages 91-94. Stresses importance of an accurate system of costs. Most convenient principles on which to base a cost system are given. OWE (16)

Foundry Equipment Industry in 1932. D. Howard Wood. *Foundry Trade Journal*, Vol. 48, Jan. 26, 1933, page 76. Advances in molding and core-making are mentioned. Effect of tariffs on industry is discussed. OWE (16)

Iron Ore Industry in 1932—Advance Summary. H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 170, Jan. 11, 1933, 3 pages. Fe ore mined in the U. S. in 1932 exclusive of ore that contained 5% or more of Mn was about 9,588,000 gross tons, a decrease of 69% from 1931, and the lowest since 1885. Shipments decreased 81%, and stocks increased 33% to the largest ever accumulated. The Lake Superior district shipped 67% of the Fe ore shipped in 1932. AHE (16)

Tin in 1932. *Tin*, Jan. 1933, pages 5-8. Statistical tables and data on production and consumption for the years 1929-1932, prices and fields of principal uses. Total industrial production was steadily decreasing; taking 1923-1925 as 100, the respective figures are for 1929-121, 1930-90, 1931-75, 1932-67. The total visible stocks in world amount to 55,000 tons. Unhealthy market conditions are discussed, a better outlook is seen only by greater consumption, no over-production being reason for the slump. Ha (16)

Food Canning in Scotland. *Tin*, Dec. 1932, pages 8-9. Great importance of fruit canning in this district for the tin industry is discussed and suggestions made for equalizing seasonal demands by extending canning activities to other fields of food canning. Ha (16)

The Present Position of Tin. *South African Mining & Engineering Journal*, Vol. 43, Part II, Sept. 10, 1932, pages 23-24. Recent upward movements in metal market, process of international rationalization, and Sn pool are discussed. AHE (16)

Base Metals and Minerals in 1932. *South African Mining & Engineering Journal*, Vol. 43, Pt. II, Dec. 31, 1932, pages 295-296. Production values for 1931 and 1932 are given for Cu, Mn, Sn, Cr, Fe, graphite, Pb, As, and several nonmetallic products and more important are briefly discussed. AHE (16)

Bismuth in General and in Spain. (El Bismuto en general y en particular en Espana.) *Revista Minera*, Vol. 83, Aug. 1, 1932, page 346. Brief note of condition of Bi in producing countries of world, as well as in lone producing province, Cordoba, Spain. DTR (16)

Aluminum Industry in 1932—Advance Summary. H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 182, Mar. 9, 1933, 2 pages. New Al produced in U. S. in 1932 amounted to 104,885,000 lbs., valued at $20,453,000, as compared with 1931 output of 177,544,000 lbs. worth $37,284,000. Transportation industry was the major consumer. Construction took 4% of the Al in 1930, 6% in 1931, and 10% in 1932. Uses are reviewed briefly. AHE (16)

The Renaissance of Basic Bessemer Steel. *Railway Engineer*, Vol. 54, Jan. 1933, page 2. Reference is made to a projected steel plant to be established in Northamptonshire at a cost of £3,300,000. Ore beds of this district are estimated to contain 500,000,000 tons of ore, which are intended to be utilized by the "cheapest method of steel making," the Bessemer process. Besides its most economical fuel consumption and low costs in labor, this process provides a valuable by-product in the form of basic slag for fertilizing, since pig irons to be used contain from 1.7-1.9% P. Reasons why basic Bessemer working had fallen into disrepute and abandoned are historically reviewed. Contrary to complete extinction in Great Britain, attention is directed to the successful operation by Luxembourg steel works. WH (16)

Mining Operations in the Province of Quebec During the Year 1931. *Annual Report, Quebec Bureau of Mines*, 1931, Part A, 1932, 146 pages. Quebec production of Cu, Au, Ag, Pb, Zn, Ti, Mo, Se, W, Cr, Be and various nonmetallics is discussed. AHE (16)

Uncommon Metals. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 15. Sources and uses for Ta, Th and Ce are reviewed. AHE (16)

Eastern Canada in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 27. 1932 was greatest year in Canadian Au industry with an output of over 3,000,000 oz., 375,000 oz. increase over 1931. Details are given. AHE (16)

New Zealand in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 24. Au exports doubled over 1931. AHE (16)

Nigeria in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 25. Sn industry is reviewed. AHE (16)

Portugal in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 30. W, Sn, Fe, U, Cu, Mn, Ti, Pb, coal, Sb, kaolin, Li, Au, Ag, Zn and Cr occur in Portugal. AHE (16)

Norway in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 30. Pyrite production was 710,000 tons (748,000 tons average for 1928-30). Ni output increased. Fe ore production was 375,000 tons, ½ that of 1930. AHE (16)

Cornwall and Devon in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, page 31. Sn industry is reviewed. AHE (16)

Copper in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, pages 4-5. General review of world conditions. AHE (16)

Nickel in 1932. *Mining Journal, Annual Review No.*, Vol. 180, Feb. 11, 1933, pages 8-9. Ni production held up better than most metals. In 1932, there was increased use of 2 Ni cast irons, Ni-clad steel plate, and high Ni stainless steel. Inco-Chrome Ni is being used in food industries. Ni cast Fe is in demand for wearing parts of cylinders and pistons. Ni-Cr-Mo cast Fe is used for cam shafts, crank shafts, and brake drums. Ni-Hard is in demand for rolls, pumps, etc. Demand for Ni-Resist has increased 2.5 times over 1931. AHE (16)

BIBLIOGRAPHIES (19)

A Select, Annotated Bibliography on the Hygienic Aspects of Aluminum and Aluminum Utensils. Mellon Institute of Industrial Research Bibliographic Series, Bulletin No. 3, 69 pages. Since 1926 the Mellon Institute has been investigating the metals used in the construction of cooking utensils, industrial food-preparation equipment, and of food and beverage containers, with special reference to the physiological action of aluminum and its alloys and to their effects on foods and food constituents. Their findings, which are published in this bulletin, indicate that aluminum is one of the most suitable metals for the construction of equipment for the handling of food. Dr. George Beal, Assistant Director of the Institute, has written an introduction to the Bulletin in which he shows that aluminum is not a poisonous metal and does not give rise to any disease, that aluminum utensils are very resistant to corrosion by foodstuffs cooked in them, and that aluminum does not accelerate the destruction of vitamins or other food accessory substances during cooking. It is a bulletin which will be of interest both to metallurgists and to their wives. M. L. Moorman (19) -B-

Cumulative Index of Stahl und Eisen, Vols. 39-50 (1919-1930). Prepared by Anni Gahrmann. Verlag Stahleisen m.b.H., Düsseldorf, 1932. Leather, 8½ x 11¾ inches, 952 pages. Price 84 RM. This index is the most complete guide to the iron and steel literature of the world as it indexes not only the original articles appearing in *Stahl und Eisen* but also the monthly index service of the Verein deutscher Eisenhüttenleute. The author index covers 262 pages and includes 51,000 listings. The subject index has 678 pages and includes 165,000 listings. There is a 9 page listing of patent numbers of German and United States patents in numerical order. The patentee names, both company and individual are included in the author index. Richard Rimbach (19) -B-

The Metal Carbonyls. R. L. Mond. *Journal Society Chemical Industry,* Vol. 49, June 13, 1930, page 271-278T; June 27, 1930, pages 287-290T. A review containing a bibliography of about 300 references on the properties, preparation and uses of the metal carbonyls. VVK (19)

Alloy Iron and Steel Patent Index, arranged according to Composition. (Eisen- und Stahllegierungen Patentsammlung, geordnet nach Legierungssystemen.) A. Grützner. Supplement to the volume on Metallurgy of Iron, in Gmelin's Handbook of Inorganic Chemistry, 8th edition. Verlag Chemie, Berlin, 1932. Board cover, 7 x 10¼ inches, 308 pages. Price 32 RM. The patents on alloy steels (and also on the ferrous alloys in which the alloying elements preponderate) that have been issued in Germany, England, France, Austria, Switzerland and the U. S. from 1880 to March, 1932, are indexed in the first column according to the range of composition specified. The next column gives, in a word, the special property or application for which that composition is suggested, and the next column gives the name of the patentee, and the country, patent number and year of the patent. When the same composition is covered by patents in different countries, these are all given. The list covers not only the ordinary low alloy steels, but the highly alloyed ferrous compositions for corrosion and heat-resistance and other special uses. Under C-Cr-Ni, C-Cr-Ni-Mn, C-Cr-Ni-Mo and C-Cr-Ni-V, there are respectively about 175, 90, 70 and 50 entries. One patent specifices composition as to C, Al, Cr, Cu, Mn, Mo, Ni, Si, Ti, V and W, all in the same steel. The author is connected with the German Patent Office, and the tabulation is obviously extraordinarily complete. The volume will be indispensable to everyone having to look up the existence of patents on any particular composition. Its preparation is a very great service. H. W. Gillett (19)-B-

MISCELLANEOUS (20)

Elasticity and Strength of Screw Connections (Elastizität und Festigkeit von Schraubenverbindungen). Julius Bach. *Automobiltechnische Zeitschrift,* Vol. 36, Feb. 10, 1933, pages 55-59. The behavior of a screw joint is investigated with respect to the distribution of force over the thread, the depth or length over which the force is borne and the notch effect of the thread. A finer thread is usually preferable, especially for small screws, as the remaining section is larger. Also how the thread is cut, whether on a cutting machine or by screw dies, influences the strength; the latter method usually increases the strength by cold-working. Several examples of good screw joints and thread-shapes are illustrated. 18 references. Ha (20)

Sulphurization of Iron by Hydrogen Sulphide and the Equilibria occurring in the Process (Ueber die Schwefelung des Eisens durch Schwefelwasserstoff und die dabei auftretenden Gleichgewichte). L. Bierner. *Mitteilungen aus dem Forschungsinstitut der Vereinigte Stahlwerke, A. G. Dortmund,* Vol. 3, Dec. 1932, pages 41-54. The equilibria $Fe + H_2S = FeS + H_2$ and $(n-\gamma)\ Fe + n\ H_2S = Fe_{(n-\gamma)}S_n + nH_2$ were investigated in the range from 550°-1080° C. Position of equilibrium changes with increasing temperature in favor of formation of H; between 875° and 895° C. a sudden increase of the H by 25% takes place which seems to point to a change of the sediment. The latter was analyzed for each equilibrium and showed from 683° to 837° a general composition corresponding to Fe_3S_4, at 875° to Fe_3S_5, and at 885° and 905° C. to FeS. The X-ray examination of the sediment showed that the permanency of the solid solution is restricted to a definite temperature range; the solid solution disintegrates upon cooling. 13 references. Ha (20)

Thermodynamic Evaluation of Test Results of Sulphurization of Iron by Hydrogen Sulphide (Thermodynamische Auswertung der Versuchsergebnisse bei der Schwefelung des Eisens durch Schwefelwasserstoff). F. Eisenstecken & L. Bierner. *Mitteilungen aus dem Forschungsinstitut der Vereinigte Stahlwerke, A. G. Dortmund,* Vol. 3, Dec. 1932, pages 55-58. The sudden increase of 25% of S in the small temperature interval from 875° to 910° C. (see foregoing abstract) was more closely investigated by thermodynamic considerations. The explanation of this phenomenon is that the sediment corresponds to the composition of iron-mono-sulphide only during this temperature interval and deviates from it at other temperatures thus causing other reactions and heat contents. The calculations with the mass law show good agreement. 7 references. Ha (20)

Lubrication of Spur, Helical, Herringbone and Bevel Gears. James I. Clower. *Iron Age,* Vol. 130, Dec. 15, 1932, pages 918-919; Vol. 131, Jan. 19, 1933, pages 132-133. Correct lubrication means the selection of proper lubricant and the proper method of application. Lubricants must possess the proper body or viscosity to form a film which will not rupture under adverse load, compressive fatigue or pitting of contacting teeth. Pitting is caused by shearing out of imperfect particles of metal. Speed and duration of oil film formation and maintenance between teeth. Soft or medium hard gears if subjected to heavy pressures and improperly lubricated, become noisy, inefficient and wear rapidly. For inclosed gears, either circulation or splash oiling is used. Open gears may be equipped with slush pan or hand oiled. Too high oil level will cause overheating due to excessive churning of oil. Open or semi-inclosed gears exposed to dirt, are lubricated with grease. The grease should be neutral, that is, contain no free fatty acid or alkali. Includes a guide to selection of proper gear lubricants. VSP (20)

Disturbances of Plane States of Stress and Bending by Foreign Inclusions. (Störungen von ebenen Spannungs und Biegungszuständen durch eingeschlossene Fremdkörper.) H. Craemer. *Ingenieurarchiv,* Vol. 4, Apr. 1933, pages 121-126. Under the supposition of a circular shape of such inclusions the states of stress and the disturbances resulting from them are considered for the single- and double-axial state of stress. These disturbances are diagrammatically shown for important particular cases. In these considerations the known disturbances on account of rivet holes are included as limiting cases. GN (20)

Steel Industry Will Profit From Experience of 1931. *Steel,* Vol. 90, June 27, 1932, pages 26-27, 32. A report of the papers delivered at the 28th national meeting of the Association of Iron and Steel Electrical Engineers, held in Pittsburgh, Pa., June 20-23. JN (20)

Vessels from a Canadian Shipyard. *Iron & Steel of Canada,* Vol. 16, Jan. 1933, pages 7-8. Summary of work and output of the Davie Shipyards at Lauzon, Que. OWE (20)

Ottawa Silica Sand for Steel Plant and Foundry Uses. *Iron & Steel of Canada,* Vol. 15, Oct. 1932, pages 122-123. Brief description of plant near Ottawa, Canada, which supplies sand for cores and molds, furnace linings, and sandblasting. OWE (20)

Numbering Code for Alloy Steels Used in Germany. Correspondence from Hans Diergarten. *Metal Progress,* Vol. 22, Dec. 1932, pages 49-50, 58, 61. The DIN numbers (Deutsche Industrie Normen), system of marking for alloy steel is described. Finished physical properties are generally specified rather than original chemical composition as in American practice. Non-ferrous numbers are also explained. WLC (20)

The Purchase of Tool Steel. J. Ferdinand Kayser. *Sheet Metal Industries,* Vol. 6, Dec. 1932, pages 503-504. Brief note on selection of material, specificational details, rolling tolerances, and time element in supplying special material. AWM (20)

What Happens In a Bearing? C. M. Larson, Harvey S. Konheim & Walter J. Albersheim. *Automotive Industries,* Vol. 68, June 10, 1933, pages 694-698. Attempt to show that the laws of bearing friction can be explained on the basis of the known properties of fluids and that it is unnecessary to invent new properties of matter, such as "lubricity" and "oiliness," for which it is difficult to find suitable definitions. It is proved in this article that the relationship between the coefficient of friction on the one hand, and the velocity, viscosity and pressure on the other, can be arrived at by applying the known laws of hydrodynamics. The article should at least serve to clarify conceptions of what takes place in a bearing when its safe-load limit is passed. DTR (20)

Weight of Zinc Sheets. J. K. Olsen. *Metal Stampings,* Vol. 5, Jan. 1932, page 59. Tabulates thicknesses in in. and weights in lbs./ft.^{2} for gages 1-28 of the Matthiessen & Hegeler Zinc Company gage. MS (20)

Weight of Thermostatic Metal-Brass and "Invar" Steel (36% Nickel Steel) of Equal Thickness. J. K. Olsen. *Metal Stampings,* Vol. 5, Mar. 1932, page 212. Tabulates weights in lb./ft.^{2} for thicknesses in decimal in. MS (20)

Preparation of Colloidal Solutions by Ultrasonic Dispersion (Préparation des colloides par dispersion ultrasonique). Néda Marinesco. *Comptes Rendus,* Vol. 196, Jan. 30, 1933, pages 346-348. Ultrasonic elastic waves at constant temperature break up the lattice of a system and disperse it in an adjacent liquid phase. A brief theory of the effect is given. Some new colloids are obtained: metallic alloys of low melting point and mercury can be dispersed in water, alcohols and in glycerine; K, Cs, and alloys of these metals may be dispersed in vaseline; mastic and white phosphorus, etc. can be dispersed in water at ordinary temperatures. Metals of higher melting point are dispersed with more difficulty, and the particles obtained vary more in size. OWE (20)

A Spectroscopic Investigation of some Metal Electrodes in Vacuum Arcs. F. H. Newman. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Vol. 14, Oct. 1932, pages 718-725. Hg, Na, and K were the 3 cathode metals investigated. Gives details of experiment. Cathode fall for Hg is about 10 volts. The values for Na and K have not been determined. Author estimates the cathode fall of Na to be about 5 volts. RHP (20)

Melting of Metals, particularly Platinum into Quartz. (Das Einschmelzen von Metallen insbesondere von Platin in Quarz.) E. Podszus. *Sprechsaal für Keramik, Glas, Email,* Vol. 66, Mar. 30, 1933, page 215. By the method described difficulties encountered in melting metals into quartz are eliminated. This is accomplished by a special glass matrix combined with the quartz. GN (20)

Fluorination of Rhenium (Die Fluorierung des Rheniums). Otto Ruff & W. Kwasnik. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Nov. 1932, pages 113-122. The preparation of ReF_6, which is a gas, is described and the reactions at 100° and 200° C. on various metals and chemicals tabulated. Two valencies of Re, 4 and 6, were confirmed, the former in chlorination, the latter in fluorination. Ha (20)

Chemistry of High Temperatures. (Die Chemie der hohen Temperaturen). Otto Ruff. *Angewandte Chemie,* Vol. 46, Jan. 7, 1933, pages 1-7. Behavior of materials at very high temperatures is described and reactions and changes in atomic and molecular structure discussed. The elements W, C and Re have the highest melting points with 3670°, 3760° and 3440° C. respectively. Carbides and mixtures of carbides: ZrC 3805, NbC 3770, MO_2C 2960, MOC 2690, MOC 2695, TiC 3410, HfC 4160, TaC 4150, W_2C 3130, WC 3140° C.; 4TaC + 1 ZrC 4205°, 4TaC + 1 HfC, 4215° C. Nitrides range from 3220° for TiN to 3645° for TaC + TaN. Borides have 3265° (ZrB), 3335° (HfB) and 3195° (WB). The highest of the oxides is ThO_2 with 3050° C. 17 references. Ha (20)

Designing Structural Steel for Economical Fabrication. Albert Reichmann. *Journal Society of Western Engineers,* Vol. 28, Feb. 1933, pages 39-46. Discussion of structural details to bear in mind to insure minimum fabrication costs. Advantages of alloy steels are pointed out. WHB (20)

The Influence of the Temperature on the Accuracy of Measuring Devices. R. A. Schmidt. *Stanki I Instrument,* No. 7, July 1932, pages 9-11. (In Russian.) Micrometer screws and other measuring instruments of similar type made of electron (92-97% Mg metal) disappeared from German market. The difference in expansion coefficient between steel and electron equal to 13.8×10^{-6} made the range of errors excessive. (20)

Bending Oscillations of Twice-Supported Crank Shafts (Biegungsschwingungen Zweimal gelagerter Kurbelwellen). O. Kluesener. *Automobiltechnische Zeitschrift,* Vol. 36, Feb. 10, 1933, pages 53-54. The natural vibrations and the vibrations enforced by the pressure of the piston and the forces of inertia of the reciprocating masses on the crankshaft are investigated by the example of a small 4-cylinder engine. A method for calculating the vibrations is explained; experimental results showed a very good agreement with the calculated values. Ha (20)

Soil Resistivity Rods Show "Hot Spots." A. V. Smith. *U.G.I. Circle,* Vol. 13, Feb. 1933, pages 15-20. Survey of soil conditions surrounding large 16" gas mains was made with "Shepard" earth resistivity rods which determine soil resistance by measurement of current passed through the earth under a constant potential between 2 electrodes. If soil resistance is low galvanic current would flow more readily from pipe to soil causing corrosion. 10,000 ft. of pipe were tested and corroded parts detected in this manner. A chart of a 12" coke oven gas main showing the measurements is reproduced. Testing of soil before laying pipes is recommended. Ha (20)

The Construction and Manufacture of Wire Rope. Percy R. Clark. *Wire & Wire Products,* Vol. 8, Jan. 1933, pages 14-21, 28. Principal features of rope manufacture, flexibility, diameter of single wires, lay of strands, etc. are fully discussed. Factors conducive to greater flexibility are: basic steel wire, wire of lower breaking strain, wire of small diameter and line contact construction. Fiber center of a rope must be very homogeneous to give pliability, to serve properly as a bed to keep strands in position, and to serve as a reservoir for lubricating the rope. Corrosion by acid or water in operation, proper coiling on reels and drums, avoiding of kinks, etc. are to be considered in handling of ropes. Ha (20)

A Very Large Ingot. *Engineer,* Vol. 154, Dec. 2, 1932, page 569. Illustration and short description of largest ingot ever made in Sheffield. It weighs 175 tons. LFM (20)

FOUNDRY PRACTICE & APPLIANCES (22)

Several Methods Available for Cupola Drop Disposal. NORMAN F. HINDLE. *Foundry*, Vol. 60, Jan. 1, 1932, pages 44-45. Discusses advantages of removal of drop from beneath cupola. Advantages of new over old method are: (1) damp material may be worked easier; (2) it is less fatiguing to workmen; (3) it will cool quicker; and (4) it allows furnaces to cool quicker. VSP (22)

Evolution of the Modern Foundry. J. E. HURST. *Iron & Steel Industry & British Foundryman*, Vol. 6, Dec. 1932, pages 67-68, 92. Historical account of development of foundry industry. CHL (22)

Testing and Rating of Core-Sands and Core-Binders. (Ueber die Prüfung und Bewertung von Kernsanden und Kernbindemitteln.) TH. KLINGENSTEIN. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Aug. 7, 1932, pages 307-310; Aug. 21, 1932, pages 324-326; Sept. 4, 1932, pages 348-350; Oct. 2, 1932, pages 392-393. See *Metals & Alloys*, Vol. 4, Feb. 1933, page MA 52. GN (22)

Molding a Water-Seal Gas Valve Pan. (Einformen der Wassertasse eines Gasventils.) H. KALPERS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 16, 1932, pages 421-422. Abstract of paper by Robert Jones in *Foundry Trade Journal*, Vol. 45, Dec. 3, 1931, page 352. See *Metals & Alloys*, Vol. 3, June 1932, page MA 184. GN (22)

Rapid progress in casting metals calls for superior foundry control

Is your department keeping pace with 1933 operating methods?

Read these abstracts and be well informed. Sections 12a on "Melting and Refining," 12b on "Casting and Solidification" and 23 on "Furnaces and Fuels" also contain information of value to you.

Mass Production of Valves. (Ueber die Massenherstellung von Küken.) PRAKTIKUS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Mar. 19, 1933, pages 117-119. Detailed discussion of an efficient method for producing valves. Molding process is especially referred to. Advantages of method described are: increased output, decreased cost of manufacture due to better utilization of the flask, no cores required, lower cost of cleaning, less waste metal. Valves thus made are free from seams. GN (22)

The French Foundry Industry in 1932. E. V. RONCERAY. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 55-57. Work done at Fourth International Foundry Congress and exhibits there are described. Progress is noted in melting, types of furnace, use of malleable castings, and production of light alloys. OWE (22)

Preparation of Molding Sand. (Die Formsandaufbereitung in zusammengesetzten Anlagen.) A. RODEHÜSER. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 25, 1932, page 516. Abstract of paper before annual meeting of the Verein deutscher Giessereifachleute, Nov. 12, 1932, Berlin. Various stages of molding sand preparation and blemishes on castings due to insufficient mixing are discussed. The edge mills used at present for milling large batches of sand raw materials, namely, old and new sand, coal and water, fulfill the desired purpose only incompletely. A new improved mixing method is described. GN (22)

German Foundry Research. J. G. PEARCE. *Foundry Trade Journal*, Vol. 48, Jan. 26, 1933, pages 79-80. Illustrates type of work carried out in the Technical High School at Aachen. OWE (22)

Foundry Research in 1932. J. G. PEARCE. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 44-45. Concerns research on cupola and its arrangement of tuyeres, molding sands, and cast Fe. OWE (22)

Bronze Tuyeres. ROBERT JONES. *Foundry Trade Journal*, Vol. 48, Apr. 13, 1933, page 252. 5 drawings show a method of casting bronze tuyeres, which avoids the difficulties arising in the usual practice of using chaplets. OWE (22)

Electro-Magnetic Separator. (Der Elektro-Magnetscheider.) H. MAURER. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Mar. 5, 1933, pages 101-102. Description of magnetic separators as used in foundries to separate iron particles from used molding sand. GN (22)

Modern Turnover Table Molding Machines. (Moderne Wendeplatten-Formmaschinen.) M. SCHIED. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Mar. 5, 1933, pages 87-88. Description of compressed air turnover molding machine, built by Vogel & Schemmann, Hagen- Kabel, vibrator of which is provided with a new type control guaranteeing vigorous sand compression within a few seconds and of a similar molding machine of the Badische Maschinenfabrik, Durlach, in which all steps of operation are jointly controlled. Latter type can be also used as stripping plate molding machine. GN (22)

Intricate Steel Castings for Automobiles. A. D. KIRBY. *Foundry Trade Journal*, Vol. 48, May 11, 1933, pages 337-339. Block cores are made of oil-sand mixture, and correct drying is of great importance. The effect of the grain size of the sand is emphasized, and permeability, strength, and moisture must be checked. The advantages and disadvantages of the use of chills are discussed. The pros and cons of oil-facing molds prior to storing are also dealt with. Bottom pouring for castings is advocated, since it maintains the fluidity of the steel and prevents slag inclusions. OWE (22)

Small Turnover Molding Machines. (Die Klein-Wendeformmaschine.) H. KALPERS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Mar. 5, 1933, pages 86-87. Small turnover molding machine, built by Gustav Zimmermann, Düsseldorf-Rath is claimed to be more rapid, simpler and cheaper than similar American machines. GN (22)

Modern Pattern Plate Replacement. (Zeitgemässe Modellplattenerneuerung.) O. SCHMIDT. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Apr. 16, 1933, pages 165-166. Modern molding plate constructions are described. GN (22)

The Work of the Institute of British Foundrymen in 1932. VICTOR STOBIE. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 57-58. Summary of work of Technical Committee of the Institute. OWE (22)

Modern Pattern-Making. W. STAFFORD. *Foundry Trade Journal*, Vol. 48, Apr. 13, 1933, pages 255-256. Pattern-making is discussed from point of view of shop equipment, drawing, cost of pattern material, economical design, and training of the pattern-maker. OWE (22)

The Jobbing Foundries in 1932. ROY STUBBS. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, page 59. Chiefly emphasizes necessity of reducing costs. Principal advances in foundry equipment are noted. OWE (22)

Black Sand. BEN HIRD. *Foundry Trade Journal*, Vol. 47, Sept. 29, 1932, pages 188-190, 192. A continuation of work previously described in *Foundry Trade Journal*, June 27, 1929, page 493. Experiments and tests were made to find effects of coal dust on sand. Following results are tabulated: (1) Condition of sand in mold after each cast, (2) appearance of casting, (3) volume of gas from sand during cast, (4) permeability and strength of sand after each cast, and (5) appearance of sand after each cast. The moisture tests were made by measuring the electrical resistance of the sand; the permeability was measured by blowing air through the sand, and the strength was found by an ordinary spring balance on top plate of which sand was pressed. Results are shown graphically, and advantages of adding coal dust to sand to stop scabbing and "drawing down" are summarized. OWE (22)

Metallurgical Developments in Railway Foundry Practice. E. MILLINGTON. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 47-48. Chiefly concerns reclaiming of scrap in some railway foundries. Improved cupolas have made this more economical. OWE (22)

Patterns and Patternmaking. E. LONGDEN. *Foundry Trade Journal*, Vol. 48, Feb. 23, 1933, pages 142-144. Deals with a classification of types of pattern work, cost and production methods, and standardization of trade practices. OWE (22)

Light-Alloy Foundry Trade—Review of 1932. E. PLAYER. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 35-36. Mentions progress in manufacture and technique of heat-treatment of light alloys. Progress in equipment for producing gas-free castings is summarized. OWE (22)

Gates and Risers. (Der Einguss- und Steigetrichter.) G. KREBS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Apr. 2, 1933, page 138; Apr. 16, 1933, pages 153-156. Author discusses proper arrangement of gates and risers with special reference to behavior of molten metal in mold and defects that may result from improper gating and risering. Means to avoid stresses and pipes in casting are discussed, suitable casting speed is emphasized. GN (22)

Arrangement of Hollow Patterns and Their Costs. (Aufbauarten hohler Modellkörper und deren Selbstkosten.) R. ARNO. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Apr. 16, 1933, pages 163-165. On basis of 2 examples the costs of combining hollow pattern bodies are discussed. GN (22)

Patterns Rule Molding Methods. EDWIN BREMER. *Foundry*, Vol. 60, Apr. 1932, pages 32-35, 78. Proper pattern equipment and ability of pattern maker facilitates rapid and economical production of castings. Familiarity with foundry practice is essential in pattern making skill. Describes operation of City Pattern Works, Detroit. VSP (22)

Intricate Core Work. J. H. LIST. *Mechanical World & Engineering Record*, Vol. 91, Apr. 8, 1932, pages 335-336. The determination of the contraction of an alloy used for a casting is discussed. Cores must be properly supported against fluid strains, and must be correctly and quickly assembled. Cooperation of patternmaker and molder is essential. An example of this kind of work is described. Kz (22)

Notes on Brass Casting. F. A. LIVERMORE. *Metal Industry*, London, Vol. 41, Nov. 4, 1932, pages 433-440. Production of sound brass castings is discussed. Recently electric furnace for melting is preferred on account of cleanliness, low upkeep, constant melting temperature. Temperature control should be accurate within 1% up to 1300° C. Use of scrap is not to be recommended as formation of oxides and absorption of gas is likely to occur; metal tends to become brittle. Proper arrangement of castings in mold is of great importance, wherever possible castings should be poured from bottom. Means for deoxidation and desulphurization are described. Ha (22)

Bronze Founding in 1932. FRANCIS W. ROWE. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 45-46; *Metal Industry*, London, Vol. 42, Jan. 13. 1933, pages 43-46. Progress was made in producing better quality castings, in lowering melting costs, in the use of induction furnaces and in developing new alloys. OWE + Ha (22)

Castings with Large Horizontal Faces. (Das Giessen von Gussstücken mit grossen wagerechten Flächen.) PRAKTIKUS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Feb. 19, 1933, pages 73-74. The author discusses the various causes for blemishes on castings with large faces. Among the blemishes particularly referred to are fins and dirty spots. The remedies are discussed. GN (22)

Iron-Lined Brake Drums Are Cast Centrifugally. EDWARD W. BEACH & EDWIN BREMER. *Foundry*, Vol. 60, Mar. 1, 1932, pages 30-33, 35; **Fuse Iron to Spinning Shell**, Apr. 1932, page 40-42, 86; **Control Product Closely**, May 1932, pages 26-29. First installment describes general features of new process of producing steel brake drums lined with alloyed cast Fe developed by the Campbell, Wyant and Cannon Foundry Co., Muskegon, Mich. In 2nd installment detailed description of casting units is given, while in 3rd installment the manufacturing process from the reception of steel drums to the shipment of final product is described. Includes also description of other machines used in process of casting Fe in the drum. VSP (22)

Feeding in the Iron Foundry. (Le Pompage en Fonderie de Fer.) DELCROISETTE. *Revue de Fonderie Moderne*, Vol. 26, Dec. 10, 1932, pages 456-457. Location and proper size of feeders, gates and risers for casting sound pieces is discussed and general rules for application are given. Ha (22)

Core Sand Mixtures. (Sables Agglomérés a Noyaux.) J. DOSKOCIL. *Bulletin de l'Association Technique de Fonderie*, Vol. 16, Aug. 1932, pages 475-484. Czecho-Slovakian exchange paper at World Foundry Congress, Paris, Sept. 1932. A study of sands and binders. In production of good castings it is necessary to study and control (a) the quality and characteristics of the silica sand; (b) the properties of the binder; (c) the mixture suitable for the casting; (d) the behavior of sand when cold and hot. Photomicrographs of silica sands are given. WHS (22)

Multiplication of Patterns. (La Multiplication des Modeles.) TRY-CHALONS. *Revue de Fonderie Moderne*, Vol. 26, Dec. 25, 1932, pages 467-468. Describes a simple convenient method to make a greater number of patterns from a single one if many pieces are to be cast. Ha (22)

The Manufacture of Monobloc Cylinders for 3-Cylinder Locomotives. R. A. THORN. *Railway Engineer*, Vol. 53, Sept. 1932, pages 340-343. Full details of the foundry and machining practice applied by Doncaster Works of London and North Eastern Railway. WH (22)

First Report of the Steel Castings Research Committee. Being a Committee of the Iron and Steel Industrial Research Council. *Iron & Steel Institute Special Report* No. 3, May 1933, 56 pages. A number of steel castings weighing from 1.5 cwt. to 4 tons were examined. Defects in steel castings were discussed with particular reference to observations on these castings. The defects encountered included blowholes, shrinkage cavities, cracks and pulls. Some castings of an intricate design and weighing about 2.5 cwt. were made under known conditions and carefully studied. In all, 16 of these castings were made, some from basic-electric steel and some from acid open-hearth steel. Good castings resulted only when the area of gates exceeded a certain figure and when the weight of the heads exceeded a certain value. Other conditions being equal, freedom from cracks increased as time to fill the mold decreased. The effects of many details in foundry practice on the quality of the castings are discussed. The general subject of steel castings is discussed and it is concluded that design is one of the most important factors. Appendix I describes results of radiographic study. Appendix II is a selected bibliography with 9 references to "Uses of Steel Castings and Prospects of the Steel Casting Industry," 7 references on "Properties of Steel Castings," 15 references on "Steel Foundry Practice." 6 references on "Defects in Steel Castings," and 7 references on "Radiographical Examination of Steel Castings." JLG (22)

New Core Making Machine. (Eine neue Kernblasmaschinenart.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Nov. 27, 1932, page 634. Description of a new type compressed air core making gun, as built by the Albertus Works, Hannover-Hainholz, Germany. GN (22)

Cylindrical Loam Cores. (Noyaux Cylindriques en Terre.) TECHNICAL COMMITTEE BELGIAN FOUNDRY ASSOCIATION. *La Fonderie Belge*, Vol. 2, June 1932, pages 106-108. Method of fabrication is described. FR (22)

Casting of Bearing Lids Made of Aluminum in Permanent Molds. (Lagerdeckel aus Aluminium in Kokillen giessen.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 27, 1932, pages 479-480. Molds for above purpose are best made of Ni-steel or Ni-gray cast Fe which have advantage of possessing a dense structure, are easily machined and will withstand large variation in temperature. In casting, molds should be preheated to 120°-160° C. Sticking of casting to mold is avoided by a fine coating with a proper facing material. Metal is best melted in crucible furnaces. Casting temperature is 720°-760° C. for Al, 760°-800° C. for Silumin. Proper dimensioning of gates in relation to wall thickness of lids is emphasized. GN (22)

Foundation Plate made with Sweep. (Mit Dreh- und Ziehschablone hergestellte Grundplatte.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 13, 1932, pages 462-463. Making of the sweeps is discussed. A discussion of molding work follows. The plate was 2180 mm. wide, 2350 mm. long, 290 mm. high, 20 mm. in wall thickness and weighed 1010 kg. GN (22)

Temporary Patterns. (Etwas über Hilfsmodelle.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 27, 1932, page 481-483. Molding of castings which are to be cast only once requires special methods in order to save pattern making costs. Paper shows a few examples, such as pipe fittings, elbows, tees, etc., how this is done. Outlined methods of procedure show that suitable auxiliary patterns can be made without difficulty. GN (22)

Tolerance of Core and Core Position. (Die Masshaltigkeit von Kern und Kernlage.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Jan. 22, 1933, pages 39-40. In determining tolerance of core and core position following points are to be considered (1) size of casting, (2) its wall thicknesses, (3) casting method, whether cast in single pieces, in series or in large amounts. Tolerances are given for various cases above mentioned. GN (22)

Production of Black Heart Malleable in Reverberatory Furnace. (Aus der Praxis der Erzeugung von Schwarzkerntemperguss im Flammofen.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Nov. 27, 1932, pages 475-476. Reverberatory furnaces for production of black heart malleable have been used in Europe only in recent years. Rules are given for judging proper conditions of melt from appearance of fractured samples and temperature of bath. Relation between composition and appearance of fracture are considered at length. GN (22)

Improvised Flasks. (Formkästen zur schnellen und billigen Selbstanfertigung.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 2, 1932, page 394. When only a few castings are to be made of a pattern and suitable Fe flasks are lacking, flasks made of wood, or of U-,L- or I-irons which are screwed together can be used to advantage. GN (22)

Processing of Molds for Small, Large, Divided and Double-Spoke Wheels. (Herstellung der Formen für kleine, grosse, halbierte und doppelarmige Räder.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 2, 1932, pages 401-404. Detailed discussion of molding practice of large fly-wheels with aid of sweeps, molding of halved wheels, wheels possessing a double set of spokes and smaller types of wheels. GN (22)

Savings in Making Rope Drums. (Ersparnisse bei der Anfertigung von Seilscheiben.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 11, 1932, pages 489-490. Shows how to make patterns, cores and molds economically by dispensing with much supplementary work. GN (22)

Production of a Case for Exhaust Regulator Valves. (Die Herstellung eines Gehäuses für Abdampfregulierschieber.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 11, 1932, pages 501-503. Detailed discussion of sweep making and molding of such a case. GN (22)

Considerations on Sweep Molding Devices for Pulleys. (Betrachtungen über Schablonneinrichtungen für Riemenscheiben.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Jan. 8, 1933, pages 17-19; Jan. 22, 1933, pages 37-39. Detailed discussion of molding by sweeps particularly wide pulleys provided with double arms. GN (22)

Some Thoughts Concerning Mixtures, the Perlit Process and the Heat Treatment of Cast Iron. HORACE J. YOUNG. *Transactions American Foundrymen's Association*, Vol. 3, Sept.-Oct. 1932, pages 325-343. Characteristics of foundry mixtures, perlit or hot-mold process and heat treatment of cast Fe are discussed. CHL (22)

Prevent Losses with Gates and Risers. PAT DWYER. *Foundry*, Vol. 60, Jan. 1, 1932, pages 46-48; Feb. 15, 1932, pages 27-30. Warped plate may be caused by any one or a combination of 2 or more of the following: faulty flask, sand, ramming, force with which metal has been poured, or with shape or location of gates and runners. Most probable cause is an uneven thickness of metal with thickest section in center. Pouring metal at low temperature is dangerous particularly with molds for thin castings. Outlines best method of procedure. Most satisfactory method of producing flanged bushings is to mold them flange down with a gate at bottom and a riser and auxiliary gate at top. Care must be used with Al bronze bushings. Red brass or gunmetal bushings flanged at one end are molded most conveniently in a vertical position. VSP (22)

Purchase Requirements for Steel Castings, with Notes on Physical Properties in Test Bars and in Commercial Castings. R. A. BULL. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 77-113. Includes discussion. The general question of specifications for C and alloy steel castings is discussed. The author emphasizes especially the undesirability of low limits for Si and Mn and the fallacy of attempting to gage the influence of any single element except in relation to the proportions of other elements. Specifications of the A. S. T. M., the U. S. Government, the railroads and various industrial firms are reviewed. VVK (22)

Addition of Fluorspar to Cupola. (Addition de spath-fluor au cubilot.) D. DEUVORST. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, Feb. 1932, pages 48-49. See *Metals & Alloys*, Vol. 3, Apr. 1932, page MA 108. GTM (22)

General Survey of the Steel Castings Industry. W. C. HAMILTON. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 45-49. A review of the progress of the steel castings industry. VVK (22)

Transportation of Material in Cupola Operation. (Materialbewegung im Kupolofenbetrieb.) K. IRRESBERGER. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Oct. 2, 1932, pages 389-391. Discusses transportation of charge in cupola plant from economic point of view. Various types of mechanical charging contrivances of cupolas are discussed, such as skip hoists, charging cranes, etc. Advantages and disadvantages of methods are dealt with. Skip hoist with central discharging of charge car is described eliminating disadvantages of previous construction, and distinguished by simple and safe operation. Common rules on arrangement of material yards are developed. GN (22)

Notes on the Design of Steel Castings. F. A. LORENZ, JR. *Proceedings American Society for Testing Materials*, Vol. 32, Part 2, 1932, pages 58-76. Includes discussion. A general discussion of the change in design necessary when castings are made from steel instead of Fe. The quick cooling of thin sections of steel, its contraction and crystallization requires the use of adequate risers or feeders. Change of dimensions in the casting should be gradual, deep pockets should be avoided and sections should be as uniform as possible. Illustrations are included. VVK (22)

Hydraulic Binders in the Foundry. (Les liants hydrauliques en fonderie.) LOUIS MAILLARD. *Revue de Métallurgie*, Vol. 29, Dec. 1932, pages 605-612; *Bulletin de l'Association Technique de Fonderie*, Vol. 6, July 1932, pages 284-289. In many French foundries the use of about 15% Portland cement with the molding sand permitted making molds and cores with excellent permeability for gases and a crushing strength of 40-45 kgs./cm.^{2} The porosity of the finished mold is controlled by the amount of water addition. The best results are obtained using water-cement ratio of 0.7 to 0.9. With the larger amounts porosity rapidly decreases, with smaller the mixture lacks physical strength. No baking is required. Castings up to 15 tons were satisfactorily made of steel. A simple apparatus for determination of gas permeability of finished molds is described. Many variables, such as time of setting, are discussed in detail. FR + JDG (22)

Recovering of Oil Sands. (La Récupération des Sables à l'Huile.) F. HUDSON. *Bulletin de l'Association Technique de Fonderie*, Vol. 6, Mar. 1932, pages 88-90. Summarized translation. See *Metals & Alloys*, Vol. 1, Mar. 1930, page 431. FR (22)

Sand Control in the Steel Foundry. A. V. LEUN. *Transactions American Foundrymen's Association*, Vol. 3, Sept.-Oct. 1932, pages 273-288. Specifications for sands, binding materials and washes are discussed. Tests and properties of molding and core sands are described in detail. CHL (22)

Open-Hearth Furnace in the Foundry. PERCY LONGMUIR. *Iron & Steel Industry & British Foundryman*, Vol. 6, Dec. 1932, pages 76-78. Descriptive. CHL (22)

The Filling of the Mold and Calculation of Gates and Risers. (Il Riempimento delle Forme ed il Calcolo dei Canali di Colata.) T. MIASKOWSKI. *L'Industria Meccanica*, Vol. 14, Nov. 1932, pages 695-704. Arrangement of gates, risers and connecting channels in the mold to obtain a perfect casting, and method of calculating their dimensions, height and width, so as to ascertain proper and rapid filling of the mold with liquid metal are discussed. Formulas are developed and tables are given to facilitate calculation of openings of different sections. Examples illustrate their use, especially for castings in quantity production. 6 references. Ha (22)

Effect of Excess of Moisture in Air Blown in Cupola. (Influence d'un Excès d'Humidité dans l'Air Soufflé au Cubilot.) N. A. MOORE. *Bulletin de l'Association Technique de Fonderie*, Vol. 5, May 1932, pages 166-168. A summarized translation. See *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 22. FR (22)

A New Method for Calculating Cupola Charges by Means of a Graphic Process. (Une Nouvelle Méthode de Calcul des Charges par le Procédé Graphique.) T. MIASKOWSKI. *La Fonderie Belge*, Vol. 2, May 1932, pages 76-83. Translation from *Przeglad Techniezny*, No. 49, 1931, pages 681-687. For calculating 3 elements, C, Si, Mn, a triangular diagram is necessary. Each pig Fe used in charges is represented by a point on triangle area as follows: C, Si, Mn are multiplied by a coefficient N so that NC + NSi + NMn = 100. Representative point is that obtained by drawing lines parallel to triangle's sides. Calculation of charges consist in drawing triangle determined by representative points of 3 cast irons in which must be found representative point of cast Fe to be obtained taking in consideration melting losses for C, Si and Mn. Position of this point, relative to vertexes of triangle, determines percentage of each cast Fe in mixture. Graphic construction is given for problem when more than 3 cast irons are used or when it is needed to have a definite scrap percentage in charges. FR (22)

Salient Points of American Steel Founding. F. A. MELMOTH. *Foundry Trade Journal*, Vol. 47, Aug. 18, 1932, pages 94-96, 100. Paper presented before the Australian Bureau of Steel Manufacturers as the exchange paper of the A. F. A., 1932. The author describes the growth and development of the steel trade in the United States and discusses the total number of tons of castings produced by various processes in 1929, subsequently dealing in some detail with methods adopted in the manufacture of open-hearth and electric steel. Molding sands and mold production are also dealt with. Attention is directed to the cleaning of castings, and the paper closes with a description of some of the special steels that are now being produced. A brief reference is made to the attitude of the American steel founder towards research. OWE (22)

Notes on Foundry Sands. F. A. W. LIVERMORE. *Metal Industry*, London, Vol. 41, Sept. 30, 1932, pages 293-294. Requirements of good sands discussed and classification into molding sands, core sands, facing sands and parting sands and their chemical analyses are given. Particular field of each class is explained. Ha (22)

Moulding and Runner Boxes. G. LONGDEN. *Foundry Trade Journal*, Vol. 47, Aug. 25, 1932, pages 109-110. Descriptive. OWE (22)

Preparation of Molding Sand. J. NORTH. *Iron & Steel Industry & British Foundryman*, Vol. 6, Dec. 1932, pages 85-87, 109. General discussion of preparation and requirements of naturally bonded molding sands. CHL (22)

Cast Iron Resistant to Growth and Oxidation. Properties of "Silal" Cast Iron. (Fontes Résistant au Gonflement et à l'Oxydation. Les Propriétés de la Fonte "Silal.") J. G. PEARCE. *La Fonte*, Apr. 1932, pages 139-140. Abstract of "Recent Developments in Cast Iron and Foundry Practice in Great Britain." See *Metals & Alloys*, Vol. 3, Apr. 1932, page MA 107. FR (22)

Behavior of Different Kinds of Core Supports in Gray and Steel Castings. (Das Verhalten verschiedenartiger Kernstützen in Stahl- und Grauguss.) H. NIPPER. *Die Giesserei*, Vol. 19, Dec. 23, 1932, pages 517-519. 5 different types of core supports, all of wrought Fe were cast in cast Fe and cast steel plates of different compositions, temperatures and wall thicknesses, and highest admissible pressure in supports and temperature distribution in them determined. Tinned supports are best for both cast steel and cast Fe, bright core supports are good in steel castings but do not fuse together in cast Fe. Not-oxidized core supports are useless. Ha (22)

Ferrous and Non-Ferrous Metals in the Foundry. W. ROSENHAIN. *Engineering*, Vol. 134, July 22, 1932, pages 107-109. Condensed from paper read before the Institute of British Foundrymen, June 9, 1932. See *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 125. LFM (22)

Some Foreign Methods of Testing Foundry Sands. H. RIES. *Transactions American Foundrymen's Association*, Vol. 3, Nov.-Dec. 1932, pages 345-359. Review of published material on European methods of sand testing and tests, and a comparison with methods in use in America. CHL (22)

The Founding of Bronze Gears. (La Fonderie d'Engrenages de Bronze.) F. ROWE. *Bulletin de l'Association Technique de Fonderie*, Vol. 5, Mar. 1932, pages 91-93. Summarized translation. See *Metals & Alloys*, Vol. 2, Feb. 1931, page 48. FR (22)

Cause and Effect in Bronze Founding. FRANCIS W. ROWE. *Metal Industry*, London, Vol. 41, Oct. 28, 1932, pages 413-416. Improper methods and carelessness in melting, alloying and casting bronzes are reasons why most castings do not approach maximum of physical properties of which the alloy is capable. This is illustrated by a few examples and suggestions are given for getting best possible conditions for liquid shrinkage, local unsoundness, arrangement of risers and gates in molds for castings of greatly varying sections and proper melting methods. In getting best values of physical behavior economies in weight are possible. Ha (22)

Balancing of Tube-Molds for Centrifugal Casting Machines (Die Auswuchtung der Rohrformen für Schleudergiessmaschinen). W. SARAN. *Die Giesserei*, Vol. 19, Oct. 28, 1932, pages 434-437. Centrifugal casting of pipes is now done mostly by Delavaud or Moore process. These 2 methods are briefly explained and method described to balance molds dynamically as it is absolutely necessary for a sound casting that all vibrations be eliminated. Ha (22)

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Foundry Problems. C. A. Howe. *Foundry Trade Journal*, Vol. 47, Nov. 3, 1932, pages 270-273. Special problems which arise in complicated moldings are discussed from point of view of dross accumulation and porosity. Best methods of gating are summarized, and practical points connected with blast and fuel in cupola are mentioned. 6 diagrams illustrate special problems. Specification of metal involves its analysis for Si, S, P, Mn and C. OWE (22)

The Sand Question in Regard to Light-Casting Production. Frank Hudson. *Foundry Trade Journal*, Vol. 48, Apr. 13, 1933, pages 257-260, 264. Influence of moisture in molding sands as affecting permeability, etc., is illustrated graphically. Bond strengths and flowability are discussed, simple devices being described for making the tests. 15 diagrams illustrate results of various tests and apparatus employed. OWE (22)

Rustless Steel Castings Must Be Made With Unusual Care. John Howe Hall. *Iron Age*, Vol. 129, Feb. 25, 1932, page 499. Abstract of address before New York Chapter of A.S.S.T. Pouring Temperature, design and control of C are among factors affecting the product. VSP (22)

Some Experiences with the Balanced Blast Cupola. H. H. Shepherd. *Foundry Trade Journal*, Vol. 47, Dec. 29, 1932, pages 399-401; Vol. 48, Jan. 5, 1933, pages 7-8. Theory and design of balanced blast cupola are summarized in connection with recent improvements and present practice. Problem of linings is discussed and illustrated by photographs. Effect of blast-pressure and its recording on charts is discussed. Details of gray-iron cupola conversion costs are given. OWE (22)

The Heat Reactions Involved in the Treatment of Cast Iron with Soda Ash. J. E. Fletcher. *Foundry Trade Journal*, Vol. 48, Apr. 6, 1933, page 239-240, 248. Exothermic character of the soda-ash desulphurizing process, previously discussed by the author (*Fuel Economy Review*, Vol. XI, 1932), is further illustrated by consideration of the various reactions taking place when soda-ash is used with molten cast iron. The desulphurizing and desiliconizing reactions are treated in actual cases, the initial compositions of the cast iron being given. The flame reaction is imperfectly understood, but like the other 2 reactions it appears to be definitely exothermic. Tables are given showing the heat evolved in the 3 cases analyzed, and the relation of the heat evolved to the proportions of S and Si removed. The mechanism of the action of soda ash *blocks* on cupola charges is qualitatively sketched. OWE (22)

Coöperation Between Molder, Core Maker and Pattern Maker. (Ein Ergebnis wirtschaftlicher Zusammenarbeit zwischen Former, Kernmacher und Modellbauer in Wort und Bild.) Fritz Freytag. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 25, 1932, pages 521-522. Various pattern parts and core boxes required in processing the mold of a flywheel are shown in sketches, their efficient manipulation by the molder is described. GN (22)

Production of a Drum of Acid-Resistant Bronze. (Herstellung einer Trommel aus Säurebronze.) A. Fischer. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 25, 1932, pages 517-518. A bronze of following composition was used: 75% Cu, 9% Pb, 5% Ni, 5% Sb, 4% Sn and 2% P-Cu. It is shown how improper alloying, melting, gating and casting caused many failures. Proper procedures for the various stages of manufacture are outlined. GN (22)

Water-Power Castings. H. V. Fell. *Foundry Trade Journal*, Vol. 47, Nov. 24, 1932, pages 313-316, 318. Necessity for accuracy in production of castings for water-power machinery, especially in large hydro-electric installations, leads to modifications in the usual foundry methods. The molding of spiral casing is treated in detail. The stay-ring pattern, molding the base, core-making, drying operations, easing, etc. are discussed briefly. OWE (22)

Prevent Losses With Proper Gates and Risers. Pat Dwyer. *Foundry*, Vol. 60, Feb. 1, 1932, pages 47-49. 26th of a series of articles. Fe molds seem particularly adaptable to production of non-ferrous metal castings, especially metals with low melting point. Bells are molded and poured according to variety of methods depending on size of castings. Large bells are made in loam and dry sand molds, usually inside special cast Fe flasks which conform to shape of bell. Sweeps are used instead of patterns. Metal is poured from ladle into pouring basin which conducts it to sprues on top of castings. VSP (22)

Prevent Losses With Proper Gates and Risers. Pat Dwyer. *Foundry*, Vol. 60, Mar. 1, 1932, pages 41-43. 28th installment. Due to peculiarities in behavior of Al bronze castings they must be molded in different manner from that used with other non-ferrous alloys. Al bronze creates dross and shrinks excessively and must be fed from risers which outweigh actual metal in the casting. Horn gate is placed with large end next to casting with Al bronze. Horizontal pouring may be used with castings 6 in. or more in diameter. Next in importance is a riser large enough to supply liquid metal to shrinking metal and high enough to exert pressure on metal in mold and thus prevent inclusion of gas bubbles. Temperature of metal is sometimes controlling factor. VSP (22)

Prevent Losses With Proper Gates and Risers. Pat Dwyer. *Foundry*, Vol. 60, Dec. 1932, pages 40-42. Thirty-sixth installment. Method used for making metal gate patterns depends on local conditions, size, shape and location of patterns, molding equipment available and number of castings on the order. When brass gate is desired for use of pattern plate, a wood pattern is made. Al or white metal is used to form gate pattern for set of patterns that are molded periodically. Pouring temperature of metal is determined by inserting end of piece of pine or other soft wood in bath. Mn bronze must be introduced into mold without agitation. Hubs of large and medium size wheels are chamfered in center to equalize metal thickness in casting. VSP (22)

Loam Mold for Large Steel Casting. H. V. Fell. *Foundry*, Vol. 60, Nov. 1932, pages 20-21, 58; Dec. 1932, pages 22-23, 54. Various component parts of airplanes are subjected to series of tests in variable density chamber. Chief points requiring attention in advance are: design, contraction, allowance, gates, feeders, pouring methods, pattern equipment and molding methods to be adopted. Gives procedure. In second installment discusses dismantling, finishing, drying, reassembling old mold and pouring metal. VSP (22)

Deep-Joint Elimination. F. C. Edwards. *Foundry Trade Journal*, Vol. 48, Apr. 13, 1933, pages 251-252. 10 drawings illustrate 2 examples of coring to eliminate deep joints. OWE (22)

Efficient Casting Design.—II. F. C. Edwards. *Foundry Trade Journal*, Vol. 47, Dec. 15, 1932, pages 363-364. Part II of the article of this title published in this journal, Sept. 15, 1932. Various devices for facilitating molding are illustrated. OWE (22)

Sinkheads and Gates. (Lunkerköpfe und Eingüsse.) Karl Grocholl. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Jan. 8, 1933, pages 5-7. Discusses proper arrangement of sinkheads and gates. In many cases gates may be too large, in other cases they may be arranged at wrong places or be too small in cross-section. Careful making and arrangement of gates and sinkheads decreases number of scrap castings and other inconveniences and promotes economies. GN (22)

Manufacture of Acid-Resistant Cast Vessels. (Die Herstellung säurebeständiger Gusskessel mit homogen eingegossener schmiedeeiserner Rohrschlange.) Geissel. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Feb. 19, 1933, pages 65-67. Considers at length the manufacture of Frederking apparatus as they are used in the chemical industry for cooling and heating purposes. The difficulties which are to be overcome in molding are especially referred to. GN (22)

Study of Molding Sands. (Etude des Sables de Moulage.) L. Gasquard. *Revue de Fonderie Moderne*, Vol. 26, Nov. 25, 1932, pages 426-445. Includes discussion. Compositions and methods of preparing old and new sands are discussed and their suitability for castings of different melting temperatures investigated. In general, sand with more than 10% impurities, consisting in maximum of 1% organic matter, 5.5% of ferric oxide, 2% lime and Mg, and 0.5% alkalies should not be used. Ha (22)

FURNACES & FUELS (23)

Annealing Furnaces for Malleable Iron and Steel Castings. C. Hubert Plant. *Iron & Steel Industry & British Foundryman*, Vol. 6, Dec. 1932, pages 111-113, 120. General account of annealing furnaces for malleable Fe and steel. CHL (23)

Annealing Furnaces for Aluminum Castings. (Glühöfen für Aluminium Gussstücke.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 53, Dec. 11, 1932, page 500. Description of modern electric furnaces for above mentioned purpose. GN (23)

Special Electric Furnaces for Annealing Copper Alloys in Brass Plants. (Fours électriques spéciaux pour le recuit des bandes en alliages cuivreux dans les laitonneries). Albert Reymond. *Journal du Four Electrique*, Vol. 41, Oct. 1932, pages 380-386. Chief advantages of electric muffle and box annealing are possibility of using charge of any dimensions and lower power consumption. The methods do not give desired uniformity. Bright annealing is possible in them particularly when annealing boxes with valves which keep them hermetically closed are used (D.R.P.454,609 and 477,178). In annealing coils further improvement in uniformity can be obtained by having heating element in center of furnace beside the one on outside. In annealing strip brass time of treatment should not be too short because otherwise uniformity would not be sufficient. Recrystallization is independent of Zn content, being affected only by previous treatment. Coarse crystallization, however, is related to Cu so that with 63% Cu 550° C. should not be exceeded though with a higher content temperatures up to 640° C. are permissible for short intervals. For first quality product furnaces at least 5 m. long are required, preferably longer. They have a much greater production and are relatively cheaper to operate. With an 8 m. furnace daily production was 15 tons with current consumption of 85 kwh./ton. Correct speed regulation is facilitated by feeding mechanism composed of 3 rolls between which strip passes with same speed, independent of diameter of coil. JDG (23)

New Induction Furnaces for Melting of Metals. (Neue Induktionsöfen zum Schmelzen von Metallen.) H. Kalpers. *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 22, Dec. 25, 1932, pages 686-687. 5 different types of new German induction furnaces are described and sketched. Demag furnace is similar to a Bessemer converter with vertical tilting axis. Siemens-Schuckert coreless induction furnace has special provisions to take care of expansion of crucibles during melting and yet always guarantee close contact with heating coil. A furnace for melting in vacuum has been built by C. Lorenz Co., Berlin-Tempelhof. In furnace of Hirsch-Kupfer Messingwerke, Eberswalde, a high power factor is attained by crucible having a suitable shape. Another furnace of same company uses crucibles of low height and large diameter. A special coreless induction furnace for melting of alloys built by Siemens Co. is described. GN (23)

Induction Crucible Furnace and its Metallurgy. (Beitrag zur Kenntnis des Induktions-Tiegelofens und seiner Metallurgie.) M. H. Kraemer. *Zeitschrift für Metallkunde*, Vol. 24, Nov. 1932, pages 281-284. Brief discussion of melting of metals and alloys in high-frequency induction furnace, and of characteristics of this type of furnace. RFM (23)

The Witton High Frequency Electric Melting Furnace. Verdon O. Cutts. *Iron & Steel Industry & British Foundryman*, Vol. 6, Jan. 1933, pages 151-156. A partially-cored type high frequency furnace which is provided with a high magnetic alloy steel container supporting the induction coil and the crucible. This container furnishes a ferro-magnetic path for portion of magnetic field which does not pass through charge and reduces stray magnetic field to an imperceptible amount. Installation of this furnace is described. CHL (23)

Modern Steel Production in High Frequency Induction Furnace. (Über die neuzeitliche Edelstahlherstellung im Hochfrequenz-Induktionsofen.) K. Böhme. *Zeitschrift für wirtschaftliche Fertigung*, Oct. 1932, Section Met., 2 pages; Nov. 1932, section Met., 1 page. Discusses electrical principles, lining, durability, wiring system and bath motion in high frequency furnaces. Author devised and describes a new method for protecting the expensive furnace coil against mechanical injuries as they may be caused by the melt breaking through the lining. Part II discusses advantages of high frequency furnaces. Data are given on power and time consumption for various steels. Economy and heat balance are discussed. GN (23)

Four-Ton Coreless Induction Furnace. Dudley Willcox. *Fuels & Furnaces*, Vol. 10, June 1932, pages 401-404; *Steel*, Vol. 90, May 30, 1932, pages 23-24. Installation and operation for melting low C stainless steel scrap and ferro-alloys for ingots of high quality steel are described. Capacity 40-50 tons/day. Ha + JN (23)

Some Features of the Coreless Induction Furnace. A. D. Meyer. *Fuels & Furnaces*, Vol. 10, Apr. 1932, pages 287-290, 293. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 86. Ha (23)

Means for Solving Coreless Furnace Problem in USSR. B. S. Barsky. *Domez*, No. 3, 1932, pages 47-50. (In Russian). Russia realizes the value of coreless induction furnaces. The largest furnace bought abroad has capacity of 1000 lbs. One built in Russia has a transformer rated 10,000 cycles and 20 kw. Plans to improve the situation are offered. (23)

City Pattern Works of Detroit. E. T. Kindt. *Heat Treating & Forging*, Vol. 18, Dec. 1932, pages 711-712. Describes small furnace for melting Al for castings. It is a gas-fired double furnace having 2 pots of 50 lb. capacity each. Pots will stand 100-150 heats. Pouring temperature is controlled by a pyrometer. Furnace gases do not come in contact with molten Al. Metal is poured directly from the pot. MS (23)

Savings Obtained by Use of Suitable Burners. H. M. Heyn. *Heat Treating & Forging*, Vol. 18, Nov. 1932, pages 656-657; *Iron Age*, Vol. 131, Jan. 19, 1933, page 134, adv. sec. page 12. Herbrand Co., Fremont, O., equipped a continuous gas-fired hardening furnace with automatic proportioning high-pressure burners. Results were a reduction of 41.5% in gas consumption per unit of production and an increase of 22.2% in production. Doehler Die Casting Co., Toledo, O., installed automatically controlled high-pressure gas burners to fire die-casting machines and obtained a 15-18% increase in production per machine hour, while life of pots was increased from average of 11 to 16 weeks. A steel company converted a continuous producer gas-fired billet-heating furnace to natural gas by application of diffusion burners. Much lower B.t.u. input was obtained, as well as much better and more uniform heating. MS + VSP (23)

Special Furnace Bright-Anneals Copper Wire in Steam Atmosphere. J. B. Nealey. *Iron Age*, Vol. 130, July 28, 1932, page 143, adv. sec. page 16. Describes furnace operated by use of entirely new principle with gas as fuel. Heat is applied to the work by convection of steam. Furnace has high thermal efficiency and anneals product with uniform ductility, free from discoloration and oxidation. Annealing chamber and gas fixed steam superheater are built together to eliminate pipe connections. Top wall of annealing chamber constitutes bottom wall of superheater. Gas fixed immersion heaters are used in superheaters. Furnace will anneal Cu wires of various sizes and weights on spool of same size or different sizes, at the same time. Maximum rate of temperature rise is limited to speed at which heat uniformly will penetrate spools of wire. This furnace was installed in plant of Diamond Braiding Mills, Chicago Heights, Ill. VSP (23)

Does Diffusion Combustion Need Free Carbon? Correspondence from Rolfe C. Gosreau. *Metal Progress*, Vol. 22, Nov. 1932, page 46. Excess C in metallurgical furnaces to protect hot metal is expensive in fuel and increased pickling costs. Diffusion combustion may be the result if H and Co are burned with insufficient air and would leave no free C. WLC (23)

Ash Is Best Measure of Value of Blast Furnace Coke. Roy P. Hudson. *Iron Age,* Vol. 129, Feb. 11, 1932, pages 399-400, 410. Value of blast furnace coke varies inversely with increase of ash content. Table shows increase in cost of pig Fe manufacture as influenced by an increase in ash content of coke. VSP (23)

Blast-Furnace and Foundry Coke. A. Jenkner. *Colliery Engineering,* Vol. 10, Jan. 1933, pages 10-13; Feb. 1933, pages 54-56. Stipulations laid down in connection with blast-furnace and foundry coke, embracing the chemical and physical qualities. Coke testing methods are discussed. Reactivity curves obtained by the Koppers method are given and it is shown that they depend chiefly on the degree of graphitisation which can be determined by microscopic examination and measurement of the electrical conductivity. Relation between production temperature of coke and graphitisation are discussed. Kz (23)

The Improvement of Upper Silesian Blast Furnace Coke and the Oxidation of Upper Silesian Coals. Hans Heinrich Koppers. *Fuel in Science and Practice,* Vol. 12, Feb. 1933, pages 52-65. See *Metals & Alloys,* Vol. 4, Feb. 1933, page MA 54. DTR (23)

Combustion of Pulverized Coal in Metallurgical Furnaces. Peter M. MacNair. *Foundry Trade Journal,* Vol. 47, Aug. 11, 1932, pages 85-86. Summarizes modern knowledge on combustion of pulverized fuel. Rate of combustion for various degrees of fineness of fuel and for principal designs of burner is discussed, and effect of preheating air and fuel is emphasized. A consideration of release of heat per unit volume leads to suggestions regarding most efficient size for furnace. Relative advantages of anthracite and bituminous coal are mentioned. OWE (23)

A New Steel-Making Process. Belgian Foundry Uses Rotary Pulverized-Fuel Plant. Vincent C. Faulkner. *Foundry Trade Journal,* Vol. 47, Oct. 13, 1932, pages 219, 228. Describes some special details of the process of the Mons Foundry Company, Belgium, where a rotary pulverized-fuel plant is in operation. Details of similar plants have been given in *Foundry Trade Journal,* April 23, 1931, page 287; Feb. 19, 1931; page 137; June 2, 1932, page 335. The points emphasized are: (1) the continuity and simplicity of the process, (2) the low metal losses, (3) the fuel and refractory costs, and (4) the small labor requirements. OWE (23)

Fire Furnaces with Powdered Coal. Frank S. O'Neill. *Foundry,* Vol. 60, Aug. 1932, pages 18-19, 50. See "Combustion Equipment Revamping in Modern Production Plant Proves Profitable," *Metals & Alloys,* Vol. 3, Sept. 1932, page MA 280. VSP (23)

Rotary Pulverised Fuel Furnace for Cast Iron. P. M. MacNair. *Engineer,* Vol. 155, Feb. 17, 1933, pages 175-176. Abstract of paper read before the Institution of Engineers and Shipbuilders in Scotland, Feb. 14, 1933. LFM (23)

Pulverized Coal for Forge Furnaces is Excellent and Cheap. C. P. Blair & C. E. Pond. *Metal Progress,* Vol. 22, Dec. 1932, pages 24-28. Installation of duplicate pulverized coal burning forge furnaces with a preheating furnace using waste gases from the other 2 is described. Heavy locomotive and car forgings and wrought Fe reclamation work is done. Temperature is manual controlled within close limits and a reducing atmosphere maintained. Economy is claimed for this type of fuel with less wear on refractories. WLC (23)

The Use of Fuel Oil in Foundries. T. F. Unwin. *Foundry Trade Journal,* Vol. 47, Nov. 17, 1932, pages 295-298, 308; Nov. 24, 1932, pages 317-318; *Metal Industry,* London, Vol. 41, Dec. 2, 1932, pages 539-540; Dec. 9, 1932, pages 568-570. While coal is cheapest source of heat units in England, it lacks the important requirement of controllability. Therefore fuel oil is recommended. Burners and devices for atomizing the oil are discussed. A convenient form of oil-fired crucible furnace is illustrated. Photographs show Sklenar, Armstrong, Selas, Stein, and Askam furnaces, various oil-fired stoves and burners. Short descriptions are given of stock oil-fired converters, core-drying stoves, and muffles for various purposes. Ha+OWE (23)

Burning Fuel Oil At a Profit. Robert C. Hopkins. *Iron Age,* Vol. 130, Aug. 11, 1932, pages 211-212. adv. sec. page 18. First of a series of articles. Deals with equipment for drop forge plant and its related heat treating and drawing furnaces in common use. 3 prime factors in making most out of fuel oil for industrial heating are: Equipment, method of operation and grade of fuel used. No industrial plant is up to date which is limited to use of high cost fuel. An efficient plant will successfully use any grade of oil on market. VSP (23)

Temperature Control by Oil Fuel. H. W. Ritchie. *Metal Industry,* London, Vol. 41, Dec. 9, 1932, pages 571-572. Fuel oil fired furnaces have certain advantages for melting of both ferrous and non-ferrous metals in that they are started more readily than gas furnaces depending on gas producers. A few examples are described. Ha (23)

Operating Experience Built Into 28-foot Normalizer. J. M. Watson. *Metal Progress,* Vol. 22, Nov. 1932, pages 22-28. Experience with heat treating plant of Jackson Division, Hupp Motor Car Corp. is given culminating in the design and erection of a 28-foot, oil-fired, normalizing furnace for small parts. Is simplified and economical in operation. WLC (23)

Modern Gas Producers and Open Hearth Furnaces. (Neuzeitliche Gaserzeuger und Siemens Martinöfen.) O. Beckmann. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 25, 1932, page 516. Abstract of a paper before annual meeting of the Verein deutscher Giessereifachleute, Nov. 12, 1932, Berlin. Describes improvements in port construction of open hearth furnaces as they have been used by März, Moll and Lackner. Most important advance in air and gas preheating is Kühn checker system. The oil-fired Poetter open hearth furnace is described. Regulators and measuring instruments are indispensable for proper control of open-hearth furnaces. GN (23)

Chicago Steel Plants Exchange Energy with Utilities. A. H. Dyckerhoff. *Steel,* Vol. 90, June 13, 1932, pages 23-26. Abstract of a series of articles appearing in *Electrical World,* Vol. 99, Feb. 27, 1932, pages 406-409; Mar. 5, 1932, pages 449-452; Mar. 12, 1932, pages 491-494; Mar. 19, 1932, pages 542-544. Description of method worked out in last few years for coupling steel and Fe plants of Greater Chicago district with power plants of gas and electric utility companies for common exchange of excess energy. These exchanges are chiefly in the forms of coke oven gas, natural gas, electricity. Since the electric companies can deliver electric power with an investment of 30% less than steel mill power plants, it is more economical for steel plant to buy greatest possible amount of electrical energy and to sell its coke oven gas to gas utility companies. The blast furnace gases are utilized in the steel plant for production purposes and excess is used to underfire coke ovens and produce the more valuable coke oven gas. Ordinarily, use of blast furnace gases for generating electric power is not economical. Since creation and consumption of energy in steel plant varies with the rate of steel production, the adoption of this method of balancing the energy flow sheet results in a saving of $0.43 to $1.36/ton of raw steel. These principles have been applied successfully to 6 basic steel plants in the Chicago district with a total capacity of 9900 tons of pig Fe. JN (23)

The Utilisation of Coke-Oven Gas in the Iron and Steel Industry. H. Lent. *Engineering,* Vol. 134, Aug. 12, 1932, pages 195-198. See *Metals & Alloys,* Vol. 4, May 1933, page MA 156. LFM (23)

Coke-Oven Gas as a Substitute for Petrol. G. E. Foxwell. *Colliery Engineering,* Vol. 9, Dec. 1932, pages 404-406. The economy, technical possibilities and experiences with coke-oven gas calls for coke-oven industry's interest in these developments which also are important for cylinder manufacturers. The high pressure demands suitable alloys, Ni-Cr-Mo-alloys being named, to produce reliable cylinders. Kz (23)

Hudson Motor Car Company. J. B. Nealey. *Heat Treating & Forging,* Vol. 19, Jan. 1933, pages 19-20. Describes indirectly heated, gas-fired low-temperature furnace, used for drawing steel gears at 400° F. Heating period is 2¼ hrs. MS (23)

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REFRACTORIES & FURNACE MATERIALS (24)

New Hydraulic Monolithic Refractory Has Unique Qualities and Remarkable Performance. *Iron & Steel of Canada,* Vol. 16, Apr. 1933, pages 60-61. Description of properties of various grades of Hydrecon, a new monolithic refractory with setting characteristics similar to that of ordinary concrete. OWE (24)

Aluminum Oxide as High-Refractory Material (Aluminiumoxyd als hochfeuerfester Werkstoff). H. GERDIEN. *Zeitschrift für Technische Physik,* Vol. 13, No. 12, 1932, pages 586-590. "Sinter-korund" is fairly pure Al oxide which has been formed according to ceramic methods and sintered at such high temperature that it has practically the properties of corundum. It has the appearance of glass, is gas tight up to 1800° C., and has a heat conductivity 18 times greater than porcelain at room temperature which value drops to 1/3 at 800° C. It stands temperature changes very well. An electric resistance furnace for 1800° C. is described made of this material. Some other applications and physical property tables are given. Ha (24)

GASES IN METALS (25)

Oxygen in Iron and Its Effects. Correspondence from N. A. ZEIGLER. *Metal Progress,* Vol. 22, Nov. 1932, page 44. Two 50 lb. ingots prepared in hydrogen atmosphere were forged, one at 850° C. and one at 1100° C. Identical O content before forging, 0.013%. After forging, the 850° C. bar contained 0.019% O, while the 1100° C. bar contained 0.081% O. Thus gamma iron has greater affinity for O than alpha iron. WLC (25)

Solubility of Oxygen in Solid Iron. N. A. ZEIGLER. *Transactions American Society for Steel Treating,* Vol. 20, July 1932, pages 73-96. Previously abstracted as Preprint No. 1, 1931. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 81. With discussion. WLC (25)

Electrolytic Hydrogen Penetrates Steel Plates. (Elektrolytischer Wasserstoff presst sich durch Stahlplatten.) *Schweizerische Technische Zeitschrift,* Vol. 30, Mar. 16, 1933, page 162. In electrolyzing experiments carried out at Kaiser Wilhelm Institut für Eisenforschung a steel tube of 5 mm. wall thickness was used as cathode in an aqueous salt solution. Tube was closed on all sides and provided with a manometer. Upon starting electrolysis pressure increased inside tube, gas pressure finally reached 176 atm. after a month. Pressure could not be further increased due to corrosion. This occurrence is explained by atomic H developed on outer wall of tube diffusing into interior and being dissolved by Fe. When Fe is saturated with H, excessive H is transformed to molecular H. This occurrence gives an explanation for frequently observed bubbles formed on enameling pickled sheets and strips. Since such bubbles are found to be formed on slag inclusions or pipes it seems that H formed on pickling is accumulated on these impurities, thus causing the bubbles. Formation of H can be considerably decreased by the addition of inhibitors. GN (25)

Oxygen in Iron and Its Effects. Correspondence from SAMUEL EPSTEIN. *Metal Progress,* Vol. 22, Nov. 1932, page 44. Refers to Dr. Grossman's letter in August Metal Progress that pure iron is abnormal. A sample of high magnetic permeability iron, free from oxygen, was perfectly normal after carburizing for 10 hours at 1725° F. WLC (25)

Hydrogen in Rimming Steel Has Adverse Effect. HENRY D. HIBBARD. *Steel,* Vol. 90, May 30, 1932, pages 27-28. Presented before Open-Hearth Committee of American Institute of Mining & Metallurgical Engineers, May, 1932. The presence of H_2-gas is chiefly responsible for the formation of skinholes in rimming steel. The amount of H_2 in the melted iron may be kept low by adding crude iron containing C to lengthen the boil, by excluding water vapor and moist gases, and by controlling the Mn content of the finished casting to between 0.10 and 0.15%. It is also advantageous to ensure a vigorous boil at a low temp. with slow teeming. JN (25)

Helium Content of Beryllium. WM D. URRY. *Nature,* Vol. 130, Nov. 19, 1932, pages 777-778. Article deals with the abnormally high He content of several Palaeozoic Be's which is probably due to the existence of Be^8. Kz (25)

Oxide Analysis by Iodine Extraction in Steelmaking Problems. J. J. EGAN, W. CRAFTS & A. B. KINZEL. *American Institute of Mining & Metallurgical Engineers, Technical Publication* No. 498, Feb. 1933, 10 pages. Small steel heats were made in a high-frequency furnace. Half of each heat was quickly chilled and the total O content determined by the I extraction method. Al was added to the balance of the heat and the total O content estimated from the Al_2O_3 content. The values determined by the I method checked those determined by the Al method even though the C content varied from 0.03 to 1% and some of the steels were killed and some were rimming steel. The I method is not recommended for steels containing stable carbide-forming elements. The significance of the results on the small-scale melts is discussed. An appendix gives directions for performing the I extraction. 4 references. JLG (25)

Note on the Influence of Volatile Chlorides on Magnesium and on Copper. J. D. GROGAN & T. H. SCHOFIELD. *Institute of Metals, Advance Copy* No. 631, Mar. 1933, 6 pages. Soundness of Mg was improved by melting metal under a flux and treating with $TiCl_4$ or CCl_4. An attempt was made to prepare a Mg-Ti alloy by treating with a large amount of $TiCl_4$, but a substance was formed that could not be melted below boiling point of Mg. Density of cathode Cu melted under a flux was increased by treatment with CCl_4 but not with $TiCl_4$. Electric conductivity of treated Cu was low, probably owing to absorption of a small amount of Fe. Sound casting were not obtained from Cu melted under charcoal and treated with either chloride. 3 references. JLG (25)

Aluminum Castings, Dense and Pore-free in All Wall Thicknesses. (Aluminium ist in allen Wandstärken dicht und porenfrei zu giessen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 30, 1933, pages 179-180. Pores in Al castings are due to occluded gases, particularly H, less to the presence of slags and other impurities. Paper deals with experiments of degasification carried on with a new mixture developed for this purpose by L. Weiss, Dresden. This compound "Alutin" has a melting point of 620° C., forms a thinly liquid melt on molten Al and avoids any gas absorption by Al or oxidation while the occluded gases are removed. Alutin is a mixture of chlorides and fluorides. With this mixture the problem of obtaining pore free Al castings seems to be solved. GN (25)

Influence of Gases on Bronze Alloys (Der Einfluss von Gasen auf Bronzlegierungen). FR. W. BAUER. *Die Giesserei,* Vol. 19, Nov. 25, 1932, pages 481-482. When melting bronzes under gases which do not react on the former (CO, CO_2, N_2) only a very limited "inverse" segregation occurs, but with gases which are absorbed by metal and liberated again during solidification (H_2, CH_4, H_2O vapor) a strong "inverse" segregation of Sn is observed. If gas enters a reaction with melt a very small inverse segregation occurs if reaction products are solid or liquid, but a very strong inverse segregation if a gaseous reaction product exists (H_2). The addition of P results in all cases in a slight inverse segregation of about 0.3%, while addition of Zn to melts with H leads to explosions. Additions of Al and Sn reduce solubility of H in Cu. Also manner of casting in different molds has an influence, also pouring temperature. It is concluded that cause of "inverse" segregation is not a uniform one that could be generalized for all cases. Under slow solidification velocity gases alone are cause while under increased solidification velocity (in metal molds) pressure by shrinking and capillary forces cause segregation which is increased considerably by gases. Ha (25)

Effect of Pressure on the Liberation of Gases from Metals. (With Special Reference to Silver and Oxygen.) N. P. ALLEN. *Metal Industry,* London, Vol. 41, Sept. 16, 1932, pages 280-281; *Engineering,* Vol. 134, Sept. 30, 1932, pages 393-394. Abstract of paper read before the Institute of Metals, Sept. 1932. See *Metals & Alloys,* Vol. 4, May 1933, page MA 158. LFM + Ha (25)

Mechanism of the Removal of Gases in Metals and Alloys. HIDEO NISHIMURA. *Suiyokai-Shi* (Transactions Mining & Metallurgical Alumni Association, Kyoto, Japan), Vol. 6, 1931, pages 503-605, 610-615, 691-692. States of gases absorbed in metals and alloys and mechanism of removal of gases are dealt with theoretically from metallographic standpoint. Author classified gases into two classes, according to existing states, that is, actual gases dissolved in metals and combined forms as oxides, nitrides, etc., and explained the mechanism of removal of these gases by means of binary or ternary equilibrium diagrams. Similarly discussing effect of other gases and deoxidizing agents on metals containing gases in solution or combined form, he concluded that gases which do not dissolve completely in metals are most readily removed from metals, on other hand, deoxidizing agents must form volatile or immiscible compounds in liquids in order to remove combined gases in metals. Criticizing theory of Schenck and others on the deoxidation of steel bath in open hearth furnace, he pointed out that such a reaction, $FeO + Mn \rightleftarrows MnO + Fe$, does not attain equilibrium but an intermediate one on way to equilibrium, if there are formed immiscible liquids between, Fe, FeO and MnO; and hence, equilibrium constant is not calculated from this equation. From such a point of view, he explained conclusively slag-metal reaction and derived a general formula of equilibrium holding between slag and metal. Lastly, he discussed chemical affinity of gases for metals from thermodynamics, and concluded that it is necessary to investigate state of equilibrium by experiments in order to study mechanism of removal of gases in metals and alloys. ST (25)

Solubility of Hydrogen in Some Metals and Alloys. (Löslichkeit von Wasserstoff in einigen Metallen und Legierungen.) LOTHAR LUCKEMEYER-HASSE & HERMANN SCHENCK. *Archiv für Eisenhuttenwesen,* Vol. 6, Nov. 1932, pages 209-214. For pure Fe, Cr, Ni, their alloys and for somewhat impure Mn the hydrogen solubility was determined up to temperatures of 1200° C. for Fe up to 1500° C. As indicated by lattice structure, dissolving power of δ-Fe was noticeably less than for the γ condition. Ni increased hydrogen solubility in alloys investigated. Cr decreased solubility in alloys with α-lattice, while it surpassed hydrogen solubility of pure γ Fe in alloys with 5 to 15% Cr in the γ range. Change in ability for dissolving hydrogen is related to arrangement of atoms in lattice. In Mn dissolving power changes with every modification. In Armco Fe, quenched from different temperatures after heating in a vacuum and in hydrogen, notch-toughness was considerably decreased by absorption of hydrogen; no influence on Brinell hardness was obtained. Calculations were made of pressures at which hydrogen tried to separate from C steel at different temperatures. MGL (25)

Diffusion of Hydrogen Through Palladium. (Diffusion de l' hydrogène a travers le palladium.) VICTOR LOMBARD & CHARLES EICHNER. *Comptes Rendus,* Vol. 194, May 30, 1932, pages 1929-1931. Previous results on the permeability of Pd to H are discordant. The results obtained by the authors refer to Pd foil of 0.314 mm. thickness. Diffusion was measured in a vacuum (1) at a constant pressure and various temperatures and (2) at a constant temperature and various pressures. Commercial electrolytic H, not purified, was used in general, a few checks with the same H dried and purified being made. Results: (1) The rate of diffusion increases rapidly with the temperature. (2) Rate of diffusion is changed by various circumstances, such as temporary contact with N. (3) The connection between pressure and rate of diffusion is approximately given by $d = Kp^{0.8}$. OWE (25)

Adsorption of Carbon Dioxide, Ethylene and Hydrogen on Pyrophoric Iron and Gold Powder. (Zur Kenntnis der Adsorption von Kohlendioxyd, Äthylen und Wasserstoff an pyrophorem Eisen und Pudergold.) A. MAGNUS & R. KLAR. *Zeitschrift für physikalische Chemie,* Abt. A, Vol. 161, Sept. 1932, pages 241-254. The goal of these adsorption-isothermal experiments was to throw light on the effect of active centers in Fe and Au. Adsorption isotherms at 0°, 20° and 40° C. for CO_2 and C_2H_4 in Au dust and C_2H_4 on active Fe were taken which however did not prove to be reproducible. Practically no surface adsorption of H on Au takes place. A diffusion in atomic form into the interior parts is however probable. There are too few or too small active centers to cause any appreciable adsorption of H on Au in contrast to CO_2 and C_2H_4. The qualitative determination of the H_2-adsorption on Fe involved great difficulties since no stable equilibria could be secured. A qualitative comparison however shows a by far more pronounced activity of the centers in Fe than in Au. The greater catalytic action of Fe in the H_2 reaction is closely connected with this phenomenon. At higher temperatures (up to 200° C.), the H_2 quantities absorbed at the active centers are only a negligible fraction of the gas quantity fixed otherwise. Cooling down to the starting temperature resulted in only small gas liberations. EF (25)

Oxygen Determination in Iron and Steel by the Vacuum Melting Method. (Zur Sauerstoffbestimmung in Eisen und Stahl nach dem Vakuumschmelzverfahren.) OSKAR MEYER & RENÉ J. CASTRO. *Archiv für das Eisenhuttenwesen,* Vol. 6, Nov. 1932, pages 189-192. Determination of gas- and oxygen content of steel and Fe according to vacuum fusion method was investigated, using an improved carbon spiral furnace. Accuracy and speed of determination were considerably increased. A quick acting pump of improved construction is described. MGL (25)

The Absorption of Hydrogen by Iron in Its Treatment with Acid and the Behavior of the Hydrogen in this Metal. (Die Aufnahme von Wasserstoff durch das Eisen bei seiner Behandlung mit Säure und das Verhalten das Wasserstoffs in diesem Metall.) F. KOERBER & H. PLOUM. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 16, 1932, pages 229-248. Review of methods for determination and effects of H in Fe is given. Best method is hot-extraction at 400° C. H can enter into Fe only in presence of a certain group of elements acting as catalyzer, both when acid dissolves Fe and in electrolytic processes. Usual impurities in Fe form very active catalyzers. Absorbed H is mainly contained near surface. Ha (25)

Alteration of Steels by Hydrogen. (Sur l'altération des aciers par l'hydrogène.) LÉON JACQUÉ. *Comptes Rendus,* Vol 195, Nov. 14, 1932, pages 878-880. Principal effect of H on steels is to cause decarbonization, and this is effect in question here, alteration being followed by simple micrographic examination of treated specimens. Microstructure changes owing to removal of C by H, and also by diffusion of C into otherwise unaltered regions. Temperature is here main factor, and effect is comparable with that of cementation. Chemical composition of steel affects is stability towards H. Thus, if a soft steel contains Cu, decarbonization is somewhat slower. Portions of metal, which have been subjected to cold work, are more susceptible to attack. OWE (25)

A Film Which Adsorbs Atomic H and Does Not Adsorb H_2. KATHERINE B. BLODGETT & IRVING LANGMUIR. *Journal American Chemical Society,* Vol. 54, Sept. 1932, pages 3781-3782. Behavior of a W and an Elinvar filament with respect to H molecules and atoms is briefly discussed. MEH (25)

Solubility of Hydrogen and Nitrogen in Aluminum. (Ein Beitrag zur Frage der Löslichkeit von Gasen in Metallen: Das Verhalten von Wasserstoff und Stickstoff gegen Aluminium.) H. BRAUN. Doctor's thesis, Technische Hochschule Aachen, 1933, 78 pages. Commercial Al and Hoppe's Al were studied for absorption of H_2 under pressure and its release under vacuum at different temperatures. Absorption was proportional to the square root of the pressure and increased with temperature. Practically all the hydrogen absorbed was released under vacuum. 100 grams of metal took up or released about 1 cc. at 800° C., 2.5 cc. at 900° C. and 4.3 cc. at 1000° C. Commercial and Hoppe's grades of Al acted similarly. No true solubility of nitrogen in Al was found from 700° to 1000° C. but some nitride was formed on the surface of the melt. The 2 grades of Al and a sample with 0.3% Ti added all acted the same as to nitride formation. Preliminary experiments indicated that presence of Cu increased the formation of nitride. The apparatus used is described in detail, as are all the experiments. HWG (25)

EFFECTS OF ELEMENTS ON METALS & ALLOYS (27)

Some Effects of the Addition of Tellurium to Lead. W. Singleton & Brinley Jones. *Institute of Metals, Advance Copy* No. 633, Mar. 1933, 10 pages. Pb containing from 0.07 to 0.10% Te has a greater resistance to chemical attack than pure Pb. Its life in an acid plant was 7 times as long as pure Pb. Addition of Te to Pb raises recrystallization temperature, and Pb-Te alloys can be permanently work hardened for use at ordinary temperatures. From 0.05 to 0.06% Te is as effective as larger amounts in preventing self-annealing. Pb of a purity of 99.9% containing a few hundredths of a % of Te can be made to have a tensile strength of from 2600 to 4000 lbs./in.^{2}. Extruded Pb-Te alloys are soft but have a very small grain size. These alloys undergo an extreme amount of reduction before fracture. Pipes made of Pb-Te alloys have a much greater resistance to bursting when water in them is frozen than have Pb pipes. Fatigue limit of a 0.05% Te alloy was found to be 0.50 tons/in.^{2} for 10 million reversals, which is about 3 times that of pure Pb. Te added to Pb alloys has the same effect as in pure Pb. JLG (27)

Steels Made Without Manganese. S. B. Ritchie. *Transactions American Society for Steel Treating,* Vol. 20, Sept. 1932, pages 193-232. See *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 26. WLC (27)

Nickel and Nickel-Chromium Malleable Iron. (La Fonte Malléable au Nickel et au Nickel-Chrome.) Léon Thiery. *Bulletin de l'Association Technique de Fonderie,* Vol. 16, Sept. 1932, pages 508-511. Paper presented at World Foundry Congress, Paris, Sept. 1932. Ni additions to malleable Fe lower temperature at which C is freed. Small additions of Cr counteract this effect. In general, Ni improves physical properties of malleable Fe. Ni-Cr additions are not as beneficial as those of Ni alone. WHS (27)

Effect of the Oxides of Silicon, Titanium, Phosphorus and Chromium on the Reduction Equilibriums of Iron. (Der Einfluss der Oxyde des Siliziums, Titans, Phosphors und Chroms auf die Reduktions gleichgewichte beim Eisen.) Josef Klärding. *Stahl und Eisen,* Vol. 52, July 28, 1932, pages 731-732. Summary of results from a paper originally published by R. Schenck, H. Franz & A. Laymann in *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, 1932, pages 129-151. See "Investigations of Equilibrium in Reducing, Oxidizing and Carburizing of Iron," *Metals & Alloys,* Vol. 4, Mar. 1933, page MA 82. DTR (27)

Selenium as an Alloy in Rustless Steels. *Iron Age,* Vol. 129, Sept. 15, 1932, pages 404-405. Describes new alloy steel developed by the Carpenter Steel Co. Main object of Se addition is to make rustless steel free-machining, replacing the S. Se has several distinct advantages over S as a free-cutting agent. In Se steel, both etched and unetched sections show that steel contains less non-metallic matter but stringers are shorter and therefore interfere to smaller extent with continuity of metal in transverse direction. U. S. patent for the steel is No. 1,846,100. VSP (27)

Phosphorus in Cast Iron. Walter West. *Metallurgia,* Vol. 7, Jan. 1933, pages 83-88. As much as 1% P was added to a hematite Fe containing 3.3% total C and 2% Si. Fe was melted in a cupola and cast into special shapes in dry-sand molds. Density, porosity and mechanical properties showed that when P content exceeded 0.3% sponginess increased. Tensile data obtained from 3 different sized test bars are reported. In series of 1.20" bars tensile strength decreased from 15.2 to 12.3 tons/in.^{2} as P increased from 0.07 to 1.13%. JLG (27)

Nickel in Foundry Brasses and Bronzes. *Metal Industry,* N. Y., Vol. 30, Dec. 1932, pages 466-467. According to work done by N. B. Pilling and T. E. Kihlgren of International Nickel Co., Ni can be used to decided advantage in a variety of foundry mixtures. Tensile strength, compressive resistance and elastic strength are improved. Best Ni content varies with nature of base mixture and is lower the higher the Sn and/or Pb content. Proportional limit and yield point are increased to a greater extent than would be expected from change in tensile strength. For a given pouring temperature, bronzes containing δ constituent show greater amounts of it in presence of Ni and Pb rich constituent develops an involved surface of contact with matrix. It seems probable that Ni dissolves in and hardens α solution. Though Ni raises melting point slightly, as little as ½% has resulted in increased length of run in spiral fluidity test, by as much as 40%. A list is given of uses for castings in which Ni has been employed to advantage. PRK (27)

Molybdenum in Cast Iron, 1933 Supplement. Climax Molybdenum Co., New York, 22 pages. Summary of effect of Mo on gray iron, with and without Ni or Cr, and a little on its effects in white and malleable iron. Some recent data are given from the literature, but without specific references. Commercial use in rolls, ingot molds, gears, cylinder blocks, brake drums, camshafts, pistons, etc., is mentioned. Beside the improvement in mechanical properties, wear resistance and creep resistance at high temperatures accruing from Mo, improvements in fluidity, density, freedom from cracking, machineability and resistance to growth are claimed. HWG (27)

Silal. A New Heat Resisting Cast Iron. A. Crawford. *Commonwealth Engineer,* Vol. 19, June 1, 1932, pages 371-374. Cast Fe subjected to alternate severe heating and cooling grows due to oxidation penetrating deeply into the body of the metal along the lines of the graphite flakes. The phenomenon is less pronounced in a fine-grained Fe where the flakes are small than in Fe where coarse flakes are present. Hitherto in foundry practice almost the sole control over the quality of cast Fe has been that exercised by the foundry man in the charging and manipulation of the cupola furnace. Metallurgists of the British Cast Iron Research Association recently discovered a series of heat resisting irons in which growth on alternate heating and cooling is only a small percentage of that which occurs with ordinary gray cast Fe. The principal ingredient producing the heat resisting quality is Si in quantities above 4% (4-10%) and cast Fe so produced is known as Silal. Besides this, Si materially reduces the scaling action and raises the pearlite transformation point, which is located at 680° C. with 2% Si and shifted to 1000° C. with 7.5% Si. Tensile strength of 10-12 tons/in.^{2} and machineability up to 10% Si are reported. Results on laboratory tests and under arduous service conditions are given. WH (27)

Ca in Metals. (Calcium in metalen.) *Polytechnisch Weekblad,* Vol. 26, Feb. 26, 1932, page 120. Process of electrolytic Ca production is described which gives metal of 98% purity. Brinell hardness = 42.5, spec. weight = 1.46. A table contains physical properties of a cast Fe untreated and deoxidized with .5% Ca. Physical properties are beneficially affected in following order: impact hardness, tensile strength, bending strength. Ca added to Cu is still more effective, while electric conductivity is reduced by 1%/0.05% Ca. Influence of Ca upon Pb is given. WH (27)

Steel For Steel Castings. W. West. *Foundry Trade Journal,* Vol. 48, Jan. 12, 1933, pages 22-24. It is concluded that no considerable advantages are to be derived from higher additions of Si to low-carbon steels for casting. It is found that no abnormal shrinkage occurs with steel containing up to 0.75%, though the viscosity increases. Steel with 0.70% Si has certain advantages, it feeds well and is remarkably free from blowholes. Tables show effect of Si and physical properties of Ni steels containing Ti. OWE (27)

Influence of Titanium on Cast Iron. (Influence du Titane sur la Fonte.) Jean Challonsonnet. *Bulletin de l'Association Technique de Fonderie,* Vol. 16, Sept. 1932 (Supplement), pages 1-11. Paper at World Foundry Congress, Paris, Sept. 1932. Ti causes precipitation of graphite in a cast Fe which would normally be white. It lowers temperature at which Fe carbide is decomposed. In malleable Fe, 0.8% Ti permits graphitization of cementite but prevents breaking down of cementite in pearlite. 17 references. WHS (27)

INSTRUMENTS & CONTROLLERS (28)

Billet Scale Removed with Relay-Controlled Spray. R. M. Boyle. *Electrical World,* Vol. 101, June 3, 1933, pages 723-724. Just after the slab has entered breaker stand 1,000 lbs./in.^{2} water spray is turned on; just before slab is through the rolls spray is turned off so that ends are hot enough for easy entry into roll passes. This action is entirely done automatically by 2 timing relays and a network of resistors, which permits the use of a radio type rheostat for adjusting the time interval. CBJ (28)

New Electronic Tube Applications in the Steel Industry. Raymond Francis Yates. *Iron Age,* Vol. 129, Mar. 24, 1932, pages 724-725. This article follows up a series of 3 published last year. Describes use of electronic tube in handling sheets from normalizing furnace and in cutting hot rods to predetermined length. VSP (28)

The Reduction of Platinum Resistance Thermometers to the International Temperature Scale. G. S. Callendar. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Vol. 14, Nov. 1932, pages 729-742. Describes methods used for reduction of observations of resistance changed to gas scale temperature, and are intended to save time in those reductions, and eliminate use of log tables. Shows formulas used for calculations. Errors in measurement vary from ± 1/50° to a maximum of ± 1/20°. RHP (28)

Temperature Measurement and Control. *Engineering,* Vol. 135, Jan. 20, 1933, pages 67-69. Discusses classification and application of various types of instruments for the measurement and control of temperature. The second part of the paper deals with the application of the thermo-magnetic cycle to the hardening of steels. A chart is given showing the principle and operation of the electromagnetic furnace. A tree shows the various classes of steels and differentiates between those suitable for treatment in the electro-magnetic furnace, and those that are not. Graphs are given which are curves from actual tests with particular steels. LFM (28)

The Naeser Colour Pyrometer. M. A. Vernon. *Metallurgia,* Vol. 7, Mar. 1933, pages 159-160. Briefly describes slide rule-type pyrometer. Gives curves showing accuracy with which temperatures can be determined. If care is used temperature can be determined to within 1 or 2%. No black-body correction is necessary as relative intensity of 2 colors are used in reading temperatures. JLG (28)

Measuring the Temperatures of Steel. *Heat Treating & Forging,* Vol. 18, Nov. 1932, pages 652-653. Describes application of photo-electric cell and timing devices for automatic temperature control of Berwick electric rivet and rod heaters. Temperature can be held within ± 10° F. that desired. MS (28)

Mechanical Heat Quantity Meter. (Wärmemengen-Zähler auf mechanischer Grundlage.) W. Geyer. *Archiv für technisches Messen,* Vol. 2, Dec. 1932, section V 221-2, page T 178. A few types of heat quantity meters of a construction similar to water meters are described. They are fairly accurate. Ha (28)

Instrument Control in Steel Works Operation. D. M. Forbes. *Fuel Economist,* Vol. 8, Nov. 1932, pages 107-110; Dec. 1932, pages 181-182. Points out necessity of using instruments for control of heat in steel manufacture. Correct location of various instruments and adequate provision for them are highly important for obtaining real practical value, particularly in open hearth furnaces. DTR (28)

Thermocouples; Principles and Selection of the Metals. (Thermoelemente: Grunderscheinungen, Auswahl der Metalle.) Geo. Keinath. *Archiv für Technisches Messen,* Vol. 2, Oct. 1932, section J2401-1, page T156. The principles of thermoelectricity are briefly explained; the points which should determine the selection of the wires composing the couple are discussed; for industrial purposes, constancy and price are most important. The thermoelectric potential series is given with voltages against Pt for 100° C. temperature difference. The following groups are recommended for technical applications: up to 800° C. constantan-Cu, constantan-Ag, constantan-manganin; up to 1000° C., constantan-nichrome; up to 1200° C., Ni-nichrome; up to 1600° C., Pt-PtRh; up to 2000° C., iridium rhodium-iridium ruthenium; up to 2400° C., carbon-tungsten. A couple of Ni-C can be used up to 1400° C. Ha (28)

Industrial Dilatation Pyrometers. (Pyromètres Industriels à dilatation.) P. Chevenard. *Revue de Métallurgie,* Vol. 29, Sept. 1932, pages 442-448. Principle used in dilatometers might be applied for industrial temperature measurement. A bar of Ni-Cr-W alloy is placed at bottom of a silica tube and its expansion is conveyed by a silica rod to multiplying lever of graduated dial. Temperature readings are possible at 1000° C. continuously and at 1100° C. intermittently. JDG (28)

Temperature Indicators Are Calibrated Easily. Norman F. Hindle. *Foundry,* Vol. 60, Mar. 1, 1932, pages 58-60. Describes thermoelectric pyrometers, those employing noble metals and those using base metals. Noble metal couples indicate higher temperatures. Requirements for proper functioning of thermocouples are: One value of e.m.f. for given temperature; steadily increasing voltage for a rise in temperature; wires to be chemically and physically uniform; temperature coefficient of resistance to be small; and couple to resist thermal chemical and mechanical action. Insulation of thermocouples is of importance. Base metal couples have several advantages over noble metal couples. 2 methods of calibration are by comparison and freezing point methods. VSP (28)

Some Observations of Automatic Temperature Control. C. E. Foster. *Metallurgia,* Vol. 7, Apr. 1933, pages 187-190. General discussion of the subject. JLG (28)

Bulk Gas Volume Measurement in Iron and Steel Works. Walter Croswelller. *Fuel Economist,* Vol. 7, July 1932, pages 427-429; Aug. 1932, pages 476-478, 491. Equipment for measuring bulk gas volume installed on a blast furnace plant with open hearth furnace units in South Wales is described. The plant consists of 2 furnaces, each producing about 350 tons of basic iron per day. DTR (28)

A New Thermocouple for the Determination of Temperatures up to at Least 1800° C.) G. R. Fitterer. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 42, Feb. 1933, 8 pages. A thermocouple was made by inserting a SiC rod in a closed-end C tube. The cold junctions were water cooled. It was calibrated by means of a noble-metal couple and an optical pyrometer. The curve is approximately linear and the volts per degree is very high, averaging 300 microvolts per degree. Both elements are quite stable, and are not chemically attacked. The new couples were used for measuring temperatures of molten steel and found to be entirely satisfactory. 10 references. JLG (28)

Instruments as an Aid to the Production Engineer. A. E. Smith. *Institution of Production Engineers,* Vol. 11, Oct. 1932, pages 258-271. Includes discussion. Paper presented before the Institution of Production Engineers, Coventry Section. Among the discussed instruments for temperature measurements are resistance thermometers, thermo-electric pyrometers and optical pyrometers. Recording of temperature and its automatic regulation are considered. Other instruments mentioned are the Chronograph and the Vibrograph. Kz (28)

Use of Optical Pyrometers in Foundries. (Utilization des Pyrometres Optiques dans les Fonderies.) M. Held. *Revue de Fonderie Moderne,* Vol. 26, Oct. 10, 1932, pages 390-392. Principles of optical pyrometers and their different types are explained and their application described. Ha (28)

EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

Heat Resistant Special Alloys. Ni-Cr-Fe Group. (Wärmefeste Spezialiegierungen. Nickel-Chrom-Eisen Gruppe.) W. HERRMANN. *Feuerungstechnik*, Vol. 20, Aug. 1932, pages 114-116. Remarkable heat and corrosion and favorable electric resistance of relatively expensive Ni-Cr alloys are emplasized. For high temperature purposes, furnace constructions and in atmospheres rich in C, Ni-Cr-Fe alloys are generally employed. Author tested a wire of 81.5 Ni, 17 Cr, 1 Co and traces of Fe, Al, Si which withstood 1000° C. for 10,000 hours. Ni low in Cr becomes brittle. Above a certain Cr concentration (about 20%) difficulties in working and cold and heat brittleness increase. 10-20% Fe offsets this effect and 0.4-0.5% C considerably improve technological properties of Ni-Cr alloys. If Mg which improves physical properties, is used as deoxidizer, C content should not be above 0.1%. Mn affects viscosity and casting properties favorably. A table gives chemical composition of some 13 Ni-Cr alloys with low amounts of W, C, Cu, Mn, Si, Mo, Al and Fe. W, Cu, Si and Al are said to improve heat resistance. A second table gives analyses of 41 commercial Ni-Cr-Fe alloys with varying additions of Si, Mn, Cu, Al, C, Mo, W, Co and Zn. Poor results were obtained by author with a 60 Ni, 13 Cr, 23 Fe, 2 Mn, 1 Si, 0.6 C alloy. Beneficial effect of Si is shown in a series of Ni-Cr-Fe alloys, heat resistance of which was raised 90% by 2% Si. Effect of C and W is still disputed. Mo, exerting a determinal influence on pure Cr-Ni alloys, improves heat resistance of ternary alloys. EF (29)

With ever increasing temperatures and pressures==what?

These abstracts are prepared in cooperation with the Joint High Temperature Committee of the A. S. M. E. and the A. S. T. M.

Embrittlement at High Temperatures. V. B. HARLEY-MASON. Memorandum by Engineer-in-Chief for the year 1931, *Manchester Steam Users' Association*, May 1932, pages 2-28. Bolts for flanges in high pressure superheated steam lines are generally made of Ni Cr steel heat-treated to 135,000 lbs./in.^{2} tensile. After a year or so of use, the notched bar impact strength of such bolts may fall almost to zero. Modern specifications for bolting material often requires the presence of over 0.30% Mo, for prevention of this brittleness. Several used bolts were taken from service (length of service not stated) and Izod tests made. Those containing 3 to 3.2% Ni and 0.7-0.8% Cr had fallen from the initial 40 ft.-lbs. to 6 or 8 in some and 20 to 24 in others. One with 2% Ni, 1% Cr had 70 to 85 ft.-lbs. One supposed to be Ni Cr Mo was found to be mild steel. 2 other bolts of 2.6% Ni, 0.75% Cr and 0.60-0.80% Mo were then found in service and gave Izods of only 5 to 12 ft.-lbs. This was not in accord with expectation and 5 other Ni Cr Mo bolts from service not over 125° C. were then tested, with Izods of 7 to 10 ft.-lbs. indicating that the initial heat treatment was faulty. Micrographs showed coarse structure, presence of free ferrite envelopes and of untempered martensite. The steel was found to be air hardening, and gave low impact on slow cooling after annealing. Proper oil quenching and tempering gave 60-70 ft.-lbs. One user reported that properly heat-treated bolts of this Ni Cr Mo steel gave 45 to 55 ft.-lbs. after 4,000 hours at 400° C., in which service they had been heated and cooled 20 times. An attempt to check the good impact of the used 2% Ni, 1% Cr bolt was made but the next used bolt chosen was found to contain 2% Ni and 17% Cr, this was therefore a stainless steel (but of very unusual composition: abstractor). It had about 60 ft.-lbs. impact. Plain 0.30% C, 4.3% Ni bolts that had been used at about 390° C. had 30-37 ft.-lbs. Normalized .38% C plain steel bolts used at this temperature had 13-15 ft.-lbs. Another mild steel bolt used on a high pressure steam line had 3 to 5 ft.-lbs. To find out what the low impact values meant in service, 2 lengths of piping were bolted together with a flange, using old Ni Cr steel bolts known to have low Izods. A 30 lb. weight was dropped 30 ft. on the flange, the pipe being supported on about a 40 inch span. The bolts did not break. Izods made on them after this test showed 12-15 ft.-lbs. The test was repeated using this time a 144 lb. weight, without breaking bolts that later gave 8-11 ft.-lbs. Izod. An unnotched Izod specimen 0.45" diameter cut from one of these bolts absorbed 120 ft.-lbs., bending over, but not breaking. Cold bend tests were then made on Ni Cr steel bolts. One bent 80° before fracture and then showed 3 ft.-lbs. notched Izod, the other 55° and 5 ft.-lbs. HWG (29)

Tensile Properties of Cu at Low Temperatures. M. KURODA. *Scientific Papers Institute of Physical & Chemical Research*, Tokyo, Vol. 19, Nov. 1, 1932, pages 163-167. Test pieces from 3 mm. Cu sheet in the annealed (800° C.) and as quenched state were pulled at low temperatures down to —180° C. The experiments proved the absence of any yield point while the limit of proportionality can be taken from the diagrams. On the strength of these experiments, the writer sees a corroboration of his formerly published theory of boundary structure according to which the yield point occurs by virture of the heterogeneity (caused by ferrite and the boundary structure) in steel. Therefore, materials which have not such heterogeneity should not show a yield point under any circumstances. WH (29)

Thermal Expansivity of Aluminum Alloys. L. W. KEMPF. *American Institute Mining & Metallurgical Engineers, Contribution* No. 10, Feb. 1933, 15 pages. Coefficients of expansion for the ranges 20°-100°, 20°-200°, and 20°-300° C. as determined at the Aluminum Research Laboratories and at the Bureau of Standards are given. All alloys were annealed. The addition of any of the usual alloying elements to Al decreases the expansivity. Estimates of expansivity of the common structural alloys are given. Additions of Cu up to 32% continuously decrease the expansivity. Some of the data appearing in the literature are criticized because part of the supposed thermal expansion was due to structural changes. 8 references. JLG (29)

High-Pressure and High-Temperature Steam Pipe Work. J. ARTHUR AITON. *Engineering*, Vol. 134, Dec. 16, 1932, pages 720-723. Condensed from paper read before the London local group of the Electrical Power Engineers' Association, Oct. 25, 1932. Discusses the relation of creep in steel to the problems encountered in installing pipes to be used at high temperatures and pressures. Also deals with various methods of joining the pipes together and of bending the pipes to ensure long life under these extreme conditions. LFM (29)

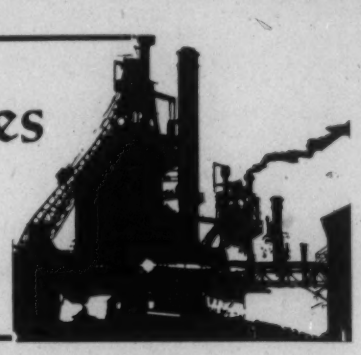
The Fatigue-Resisting Properties of Light Aluminum Alloys at Elevated Temperatures. J. W. CUTHBERTSON. *Institute of Metals, Advance Copy* No. 629, Mar. 1933, 12 pages. Load-deflection tests in which loading was continuous were made at temperatures up to 460° C. Materials tested consisted of 6 strong-Al alloys that had been hardened by heat treatment and commercial Al. As testing temperature increased to 300° C. fatigue limit as determined by the accelerated test decreased slowly, limit at 300° C. being not less than 65% of that at ordinary temperatures. Values obtained for higher temperatures were unreliable. Actual endurance tests were made with Wöhler machine at temperatures up to 300° C. They showed that values obtained by load-deflection method were all about 10% too high. S-N curves showed that endurance limit of Al was 2.9 tons/in.^{2} at 20° C., and 2.0 tons/in.^{2} at 150° C. For duralumin endurance limits were 9.1 tons/in.^{2} at 20° C., 7.8 tons/in.^{2} at 183° C., and 8.0 tons/in.^{2} at 220° C. Modulus of elasticity as determined from load-deflection curves decreases slightly as temperature increases. 7 references. JLG (29)

REDUCTION METALLURGY (31)

Removal of Arsenic from Iron Ores. (Entfernung des Arsens aus Eisenerzen.) W. RUFF & ERICH SCHEIL. *Stahl und Eisen*, Vol. 52, Dec. 1, 1932, pages 1193-1195. Fe arsenate and Fe arsenide which occur in Fe ores cannot be driven out by simple roasting which, however, is possible with a lower oxide, probably Fe arsenite. It is possible to reduce Fe arsenate and, if necessary, Fe arsenite in Fe arsenide by CO or H and to decompose it by CO_2 into Fe_2O_3 and volatile As. Both processes can be applied successively or with a gas mixture. Most favorable results with the ores investigated were obtained at 900° C. with a mixture of 60% CO_2 and 40% CO or 80% CO_2 and 20% H_2O; As content could be reduced from 0.73 to 0.035 or 0.062%, resp. H-CO_2 mixtures gave less satisfactory results than CO-CO_2 mixtures, as presence of water vapor is a hindrance to removal of As. Ha (31)

If You Smelt Ores

Here Are New Ideas for You.



The Reducing Velocities of an Iron Ore by Various Gas Mixtures of CO, CO_2 and N_2. ISAO ISHIBE & NOBORU HIRANO. *Tetsu Hagane*, Vol. 18, Sept. 1932, pages 913-921. Various mixtures of CO, CO_2 and N_2 in which sum of partial pressures of CO and CO_2 was kept at 0.4 or 0.6 atm., and ratios of CO_2/CO were varied from 0 to 2.5, was passed through Johoré hematite ore at rate of 100 cc./min. and at 700°, 800°, 900°, and 1000° C. CO_2 in gas passed through sample was analyzed every 10 minutes; amount of O from Fe ore was calculated from difference between volume of CO_2 in exhaust gas and in reducing gas. The more the ratio of CO_2 to CO in the reducing gas increases, the more the velocity of reduction of ore decreases, and at lower temperature, a small variation of that ratio has more effect on velocity of reduction than at higher temperature. In general, when value of CO_2/CO in reducing gas approaches value of CO_2/CO at equilibrium condition of reaction $FeO + CO \rightleftarrows Fe + CO_2$, reducing velocities become very slow. Referring present experimental results to results of W. A. Schlesinger, who had measured temperatures and ratios of CO_2 to CO in furnace gases at various heights in an Fe blast furnace, reducing velocities of an Fe ore at various heights of stack were calculated. Taking temperatures, partial pressures of $CO + CO_2$ and ratios of CO_2 to CO equal to those measured by Schlesinger, the time taken for the reduction of Johore ore at 700° C. was 33 times that at 1000° C. in present experiment in which 100 cc./min. of reducing gas was passed through 1 g. of sample of 1 mm. size. TS (31)

Reduction of Iron Oxides by Carbon and Potassium Cyanide at High Temperatures. (Reduktion von Eisenoxyden durch Kohlenstoff und Zyankalium bei hohen Temperaturen.) FRIEDRICH KÖRBER & HANS HEINZ MEYER. *Archiv für Eisenhüttenwesen*, Vol. 6, Nov. 1932, pages 173-182. Gas formation occurring in reduction of Fe oxide or Fe ores by C or KCN on sudden heating is studied in relation to temperature and mixing proportions. In porous ores rate of development of gas is greater than in dense ores, especially if greater amounts of carbon are separated out in a finely divided condition within ore. Reduction on quicker heating at higher temperatures takes place so turbulently that destruction of walls of blast furnace can result from development of high pressures. KCN can develop a great stress in the blast furnace by sudden evaporation alone. MGL (31)

Cast Iron and Ammonia. A. D. GOTLIEB. *Domez*, No. 3, 1932, pages 1-8. A suggestion was made to run the blast furnace as a source of H_2-N mixture for NH_3 synthesis. Excess of N and deficiency in H_2 was to be corrected by enrichment of the blast with O_2. Detailed heat balance shows that the procedure proposed is impractical for making any kind of cast Fe because the furnace has to be run as a gas producer. (31)

A Graphical Method for Calculating Blast Furnace Burden. N. A. KOSTYLEV. *Domez*, No. 7, 1932, pages 1-18. Graphical method for calculating blast furnace burden proposed by W. Mathezius necessitates guessing at final slag composition and eliminates flue dust from calculation. One starts with ores and adding to them successively fluxes and ash of coke, determines the composition of the final slag and sees whether or not it is suitable for the purpose. In proposed method, composition of slag is predetermined. Calculation starts with ash of coke, consumption of which is set at a desired figure. It proceeds in the reverse order to the method used by Mathezius and in final result gives amounts of ore necessary for production of Fe of predetermined quality with desired slag. Calculations are made on a large triangular diagram, about one meter on the side, permitting plotting the values within 0.1%. Several detailed numerical examples of actual burden calculation illustrate the paper. (31)

A Study of the Limestones from the Standpoint of Their Suitability for Blast Furnace Use. P. P. DEMCHUCK & B. A. SPEVAKOV. *Domez*, No. 7, 1932, pages 19-27. (In Russian). In addition to usual chemical specifications, physical properties of limestone are indicative of suitability for blast furnace use. Limestone giving smallest amount of fines by Halb Micum tumbling barrel test for attrition gives best furnace performance. Gas permeability is of little interest because raw limestones are impermeable both to air and to O_2. After calcining it was found that rate of CO_2 removal depends on porosity, which was determined in raw limestone by Seger method. (31)

Effect of Sodium Carbonate on Low-Temperature Reduction of Iron Ores. G. C. WILLIAMS & R. A. RAGATZ. *Industrial & Engineering Chemistry*, Vol. 24, Dec. 1932, pages 1397-1400. Presence of Na_2CO_3 in a carbonaceous reducing mixture markedly influences rate of reduction of Fe ores as judged by their metallic Fe content after reduction. Percentage reduction increases with temperature, time, and Na_2CO_3. Effect of Na_2CO_3 appears to be most marked at 900° C. MEH (31)

The Blast-Furnace. (Le Haut-Fourneau.) H. MOREL. *La Fonte*, Apr. 1932, pages 108-119. In Europe a furnace of 1500 tons daily output is under erection. The inside lining of which is nearly cylindrical. The large furnaces are adequate only for steel mill pig Fe and not for foundry pig Fe. With gas cleaning devices, 2 Cowper stoves are sufficient for each blast-furnace instead of 4 or 5 previously necessary. The efficiency of the use of gases is considerably higher in new systems. The reversing of gas currents in Cowper stoves is automatic and takes only 30 or 40 seconds. Handling equipment is thoroughly studied for the production of foundry pig Fe. These necessitate storing materials of different composition in large hoppers. Accurate mixing of materials is obtained on trucks equipped with weighing machines. Possibilities of blast-furnace for producing metal intended for pouring castings, necessity of constant temperature of air blown in furnace and charging of materials as regularly as possible are discussed. FR (31)

ORE CONCENTRATION (33)

Milling Methods and Costs at a Flat River (Mo.) Mill. WILL H. COGHILL & R. G. O'MEARA. *United States Bureau of Mines, Information Circular* 6658, Oct. 1932, 36 pages. Ore assays about 3.5% Pb, present as galena. Minor amounts of pyrite, marcasite, chalcopyrite, and sphalerite occur. Gangue is chiefly dolomitic limestone. Concentration is by tabling and flotation. Table concentrates, 76% Pb, constitute about 52% of the output. Flotation concentrates average 71% Pb. Reagents are K xanthate (0.083 lb.) NaCN (0.04 lb.), and cresylic acid (0.20 lb.) or pine oil (0.06 lb.). Pb recovery is 96-97%. Details are given. AHE (33)

Gravity Milling and Flotation of Low-Grade Gold Ore. JOHN B. HUTTL. *Engineering & Mining Journal*, Vol. 133, Dec. 1932, pages 630-631. At mine surface plant of Beebe Gold Mining Co. in Georgetown, Calif., results have been very gratifying in treating a low-grade ore body. Metallurgical flowsheet and operating costs are shown. WHB (33)

Canadian Radium Ore-Treatment Process Being Developed. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, June 24, 1932, page 616. Abstract of a report by Canadian Pacific Railway regarding Department of Mines investigations on treatment of pitchblende ore recently discovered in Great Bear Lake region. About 98% of the Ra is extracted from the ore with Ba, yielding a concentrate of 1 part Ra to 100,000 parts Ba. Concentrate is further purified by fractional crystallization, about 75% of the Ra being recovered. JN (33)

Flotation (33c)

The Treatment of Gold Ores by Flotation. H. C. CURWEN. *South African Mining & Engineering Journal*, Vol. 43, Part I, May 28, 1932, pages 339-340; June 25, 1932, page 441; July 16, 1932, pages 487-488. Au and Ag ores are classified into 7 major groups for which 5 treatment schemes are proposed. Advantages of a flotation-cyanide plant over an all-cyanide plant are given. Experimental results and operating practice at McIntyre Porcupine Mill, Independence Mill, and the Alaska Juneau are used for illustration. AHE (33c)

Developments in Flotation-Cyanidation. L. E. TUCKER & S. J. SWAINSON. *Engineering & Mining Journal*, Vol. 133, Dec. 1932, pages 618-620. Modern chemicals have been developed to replace the old oil mixtures for flotation. Flotation of native Au is well established. Trend in treatment of precious-metal ores is toward use of a combination of flotation and cyanidation. Most common groupings (10) of treatment methods for this type of ores are discussed. WHB (33c)

Flotation-Cyanidation Supplants All-Cyanidation in Russia. M. C. HAAS. *Engineering & Mining Journal*, Vol. 133, Oct. 1932, pages 511-515. Ore from the Kochkar Au mines, about 50 miles southeast of Chiliabinsk in southern Ural Mountains is low-grade. Development work is outlined. Substitution of flotation for cyanidation has resulted in simplification of flowsheet, power economy, elimination of sand leaching, a reduction by 90% of operating time in slime department, low operating and capital cost, and, as an accessory treatment, has solved difficulties of a metallurgical nature, such as removal of cyanicides. WHB (33c)

Statistical Microscopic Examination of Mill Products of the Copper Queen Concentrator, of the Phelps Dodge Corporation, Bisbee, Ariz. R. E. HEAD, ARTHUR L. CRAWFORD, F. E. THACKWELL & GLEN BURGENER. *United States Bureau of Mines, Technical Paper* 533, 1932, 48 pages. The following products from the Copper Queen concentrator were examined: sand-flotation feed, concentrates and tailings and slime-flotation feed, concentrates and tailings. Each was separated into 12 size fractions from +65 mesh to theoretical —2300 mesh (by elutriation) and examined microscopically. Distribution of total Cu, acid-soluble Cu, sulphide Cu, Fe, S and the minerals—chalcocite, chalcopyrite, covellite, bornite, malachite, pyrite, and hematite, both free and locked in combination with each other for each size of each product is tabulated. The chief problems in the treatment of this ore are due to the intimate association and intergrowth of chalcocite and pyrite. Grinding to separate is far from economical. The major metallurgical problems of each circuit are considered. AHE (33c)

Magnetic Separation (33d)

The Laboratory Concentration of Texada Island Iron Ore. T. W. HARDY & H. H. BLEAKNEY. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 156-158. A magnetite ore analyzing Fe_3O_4 85.59, $CuFeS_2$ 0.13, FeS_2 0.20, MnO_2 0.16, SiO_2 8.41, P_2O_5 0.13, CaO 2.80, MgO 1.17, and Al_2O_3 1.31% was crushed to various sizes and concentrated by wet magnetic methods. The concentrates from the —40 mesh and finer will all make a sponge Fe containing 90% Fe or better if complete metallization is assumed. These high Fe contents are accompanied by over 97% recovery and virtually complete elimination of S. AHE (33d)

The Laboratory Concentration of Iron Ore from Bathurst, N. B. T. W. HARDY & G. S. FARNHAM. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 158-160. A magnetite-hematite mixture analyzing Fe_2O_3 42.76, Fe_3O_4 22.15, SiO_2 20.46, CaO 2.25, MgO 1.08, MnO 2.56, Al_2O_3 1.95, P_2O_5 1.48, SO_3 0.66 and loss on ignition 4.65% was given a reducing roast, ground and concentrated by wet magnetic methods. Even after grinding to —200 mesh concentrate is unsuited for the manufacture of sponge Fe, chiefly on account of its P content, together with comparatively high S and residual gangue. By grinding to —80 mesh, nearly 57% of the insoluble, 44% of the S, and 50% of the P are rejected to give a satisfactory concentrate for blast furnace use. AHE (33d)

New Experiences in Iron Ore Dressing. (Neue Erfahrungen in der Eisenerz-Aufbereitung.) KARL DRESCHER. *Stahl und Eisen*, Vol. 52, Aug. 11, 1932, pages 773-779. Methods used in concentrating German Fe ores are reviewed. As these ores are of poor, conglomerate nature new, more economical processes were sought. Fe content in raw ores varies from about 20 to 50% which has a great influence on economy of operation. New 3 stage process is described: (1) crushing, (2) washing in water, (3) screening or classification and (4) magnetic separation. Operating results are described. 8 references. Ha (33d)

New Method for Concentrating German Iron Ores. (Ein neues aussichtsreiches Verfahren zur Aufbereitung deutscher Eisenerze.) L. KRAEBER. *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Feb. 5, 1933, page 71. Oxide Fe ore is mixed with $FeCO_3$ and heated in the absence of air. The result is a product that can be concentrated magnetically. GN (33d)

Crushing (33e)

Grindability of Various Ores. W. L. MAXSON, F. CADENA & F. C. BOND. *American Institute Mining & Metallurgical Engineers, Contribution* No. 25, Feb. 1933, 16 pages. A laboratory method for determining the "closed-circuit" grindability of ores is described. Ore is ground in a 12" x 12" ball mill, using a constant weight of balls. Particles below a certain fineness are removed periodically and additional ore added. Results showed that grindability ratios for different ores were greatest at the coarser sizes. Various materials exhibited marked differences in grindability at different sizes. Results for numerous ores are given. Formulae for evaluating the results are included. 2 references. JLG (33e)

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MANUFACTURERS' LITERATURE

Beryllium Copper

Many of the desirable properties of steel and of copper are combined in alloys of beryllium and copper. They have high fatigue limits, great ductility, corrosion resistance equal to that of the wrought copper-tin alloys and in addition they are heat treatable. A booklet from the Riverside Metal Company tells about these alloys, giving their properties and suggesting many applications for their use. (243)

Hardness Testing Machines

Bulletin 1130 from the Gogan Machine Corporation illustrates their Brinell and diamond type hardness testers suitable for testing any material or shape. These machines are foot pedal operated, have direct reading depth gauges as well as other features which make for accuracy and speed. They will operate accurately in both hot and intensely cold temperatures. (244)

Combustion Equipment

Proportioning valves for gas-air and oil-air, gas burners, oil burners, blowers, safety shut-off valves and other equipment for industrial fuel burning are illustrated in a leaflet received from the North American Manufacturing Company. (245)

Welding Rods

Bulletin No. 140 from Una Welding, Inc., compiles the complete line of their coated welding rods. Each type of rod is discussed as to the sizes in which it is available, the uses for which it is suitable, the nature and purpose of its coating and the range of welding current recommended for each size of rod. (246)

Herculoy

Revere Copper and Brass Incorporated are distributing reprints of an article written by their Director of Research for the August issue of *Metals & Alloys*. The article is a very detailed discussion of their Herculoy, a copper-silicon-tin-zinc alloy giving its analysis, general properties and applications and uses. (247)

Industrial Heating Catalog

Catalog 247 from the Westinghouse Electric & Mfg. Company presents the entire line of Westinghouse apparatus together with data and information which enable the user to determine the exact size, capacity and operating costs of the right equipment for his particular job. Forty-eight illustrations of Westinghouse installations are given. (248)

Electric Heating in Controlled Atmospheres

The Cleveland Electric Illuminating Company has assembled under one cover several related articles by recognized authorities on the general subject of Electric Heating in Controlled Atmospheres. The development of low-cost artificial atmospheres and electric furnaces in which these gases can be efficiently employed is a subject on which manufacturers in the metal-working industries will find it to their advantage to be fully informed and so this booklet will be of much interest. (249)

Fabrication of Nickel-Clad Steel Sheets, Strips and Wire

H. Boker & Company, Inc. have issued their Bulletin No. 1 which gives technical data on nickel-clad steel sheets, strips and wire, together with methods for their fabrication. (250)

Electric Furnaces

The Hayes "Certain Curtain" electric furnace was developed in 1926 to fill the demand for a positive furnace atmosphere control. It is designed for heat treating at temperatures between 1850° and 2500° F. A pamphlet which describes the new principle of atmosphere control which is embodied in this furnace may be obtained from C. I. Hayes, Inc. (251)

Lead

The September issue of *Lead*, published by the Lead Industries Association, illustrates the use of lead for handling corrosive solutions used in photography. Interesting details of lead work on a prize winning home are also shown. (252)

Pulverized Coal in the Foundry

Great savings are made possible by the use of pulverized coal for firing rotary melting furnaces for gray iron, for firing air furnaces in connection with duplexing processes for high test and other irons, for making seacoal, etc. A recent pamphlet from the Whiting Corporation describes various installations of their pulverized coal equipment. (253)

Refractory Products

A 6-page folder from the Standard Fuel Engineering Company gives a complete description of their refractory cements, fire brick, etc., as well as general information of a technical nature on their use. (254)

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Nitralloy and the Nitriding Process

The Ludlum Steel Company has issued a 34-page booklet devoted to a series of alloy steels containing varying amounts of carbon with 1% Al, 1% Cr and .2% Mo, marketed under the name of "Nitralloy." These steels show a maximum surface hardness when nitrided. The physical properties of Nitralloy and the analyses of the different grades are given together with a complete discussion of the nitriding process and the equipment used. (255)

Fuel and Electric Furnaces

The Westinghouse Electric & Mfg. Company is distributing reprints of an article entitled "A Study of Fuel and Electric Furnaces." Tests, such as are described in this investigation, show definitely whether proper heat treatment is being obtained at the lowest cost. Savings as high as $59,220 per year were made possible for one company. (256)

Nickel Steel

Several interesting articles are included in the August issue of *Nickel Steel Topics,* published by the International Nickel Company, among them being one on the gyroscope stabilizers used on the "Conte di Savoia" to minimize ship roll. A new welding rod for use in welding manganese steel is described and No. 7 of the series of "Topical Talks" is devoted to fatigue tests. (257)

Pyrometers

The Leeds & Northrup Company has issued a catalog describing and illustrating their pyrometers, devoting one section to the application of these instruments. (258)

Tungsten Carbide

An attractive pamphlet from the Firth-Sterling Steel Company contains an informative discussion of their cemented tungsten carbide. The differences between the manipulation of high speed steel and tungsten carbide is clearly brought out. The booklet is accompanied by a price list showing the sizes and styles in which these tools may be obtained. (259)

Hydrogen Welding

The Bundy Tubing Company has prepared a most interesting booklet on their copper-hydrogen-electric welding furnace. The process is briefly and concisely explained, it is compared with other methods of assembly and possible applications are suggested. (260)

Polishing Machines

Catalog No. 1196 from E. Leitz, Inc. introduces their one-spindle and two-spindle automatic polishing machines. These machines use a magnetic device which permits removal, replacement and perfect alignment of the specimen at any time during the process of preparation, and will fill the requirements of many laboratories who do not need the four-spindle type. (261)

Pickling

Bulletin No. 15 from the American Chemical Paint Company describes a new departure in the process of cleaning metals, particularly iron and steel, in which small quantities of the chemical Rodine, when added to the cleaning bath, cheapen the process, produce better work and improve conditions in the cleaning department. (262)

Arc Welders

A leaflet from Hobart Brothers emphasizes the necessity for counting the kilowatts when choosing a welding machine rather than giving attention only to the amperage. The company is prepared to furnish welding machines to meet all requirements, and several of them are illustrated in this leaflet. (263)

Recording Instruments

Bulletin No. 380 of the Bristol Company is intended to give some idea in regard to the very complete line of Bristol's instruments for recording, indicating and controlling. It emphasizes the simplicity of principle and construction which features these instruments. (264)

Corrosion Resisting Steels

Bulletin S-46 from the Allegheny Steel Company gives the chemical composition of their Allegheny 46, a low-alloy heat and corrosion resisting steel. Its physical properties are listed, both at ordinary and elevated temperatures. (265)

Luxit

The Alpha-Lux Company, Inc., has issued a leaflet describing their "Luxit" for lining gas or oil fired crucible furnaces, for patching cupola linings and for lining ladles. The same company has prepared several folders describing their "Liquitol A" for steel and "Liquitol B" for iron which are said to reduce cavities and porosities in castings and which do not affect physical or analytical properties of steel. (266)

"Lectrodryer"

A circular distributed by the Pittsburgh Lectrodryer Corporation is devoted to their new "Activated Alumina" system for drying air and gases. It can be used in controlled atmosphere annealing of deoxidized sheet, dehumidification of warehouses and special process rooms, industrial and chemical processes and gas conditioning. (267)

Arc Welding Supplies

A 24-page bulletin, No. 3304, of the Lincoln Electric Company, gives a full description with prices of electrode holders, cables, protective lenses, protective clothing and various supply parts as well as electrodes for all kinds of welding. (268)

Dowmetal

The Dow Chemical Company has prepared a number of data sheets giving the composition and uses of their magnesium alloys, their mechanical properties and the sizes in which bars, angles, channels and tees of these alloys can be furnished. The sheets are punched for binding. (269)

Fatigue Machine

Bulletin No. 1 from the Thompson Grinder Company describes the R. R. Moore Fatigue Machine for determining the resistance of metals to repeated stresses, the effects of various factors on the life of metals and causes of service failures. (270)

Nitralloy

The three groups of Nitralloy are described in a leaflet issued by the Nitralloy Corporation. It also discusses the special alloy steels classified as "Nitrard" which give a core hardness of 500-650 Brinell, and "Nitricastiron," their nitrided cast iron. Lists of applications for the alloys are given. (271)

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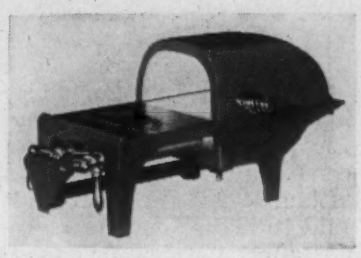
NEW MATERIALS and EQUIPMENT

Deep Drawing Steel With Unusual Properties

The American Rolling Mill Co., Middletown, Ohio, announce the development of a new grade of deep drawing sheet metal claimed to possess many unusual physical properties. The material is said to have the following characteristics: 1. Excellent ductility; 2. Great uniformity of physical properties; 3. Ductility not impaired by temper cold rolling; 4. Permanent freedom from stretcher straining in the tempered condition; 5. No change with lapse of time in respect to ductility, yield point, tensile strength and hardness. The combination of qualities makes the metal exceptionally well suited for deep drawing requirements.

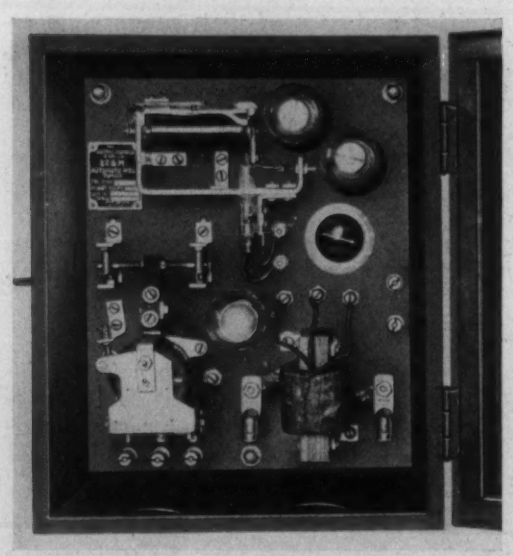
Bench Gas Furnace



Economy and time-saving are achieved in doing small jobs by using a new 2-burner gas bench furnace recently brought out by the Red Devil Mfg. Co. Its use avoids operating a blower or waiting for a slow-starting charcoal pot. Being fully lined, it can be used not only for heating soldering irons (its most widespread application) but for heat-treating small tools, dies and parts, and also for melting small quantities of soft metals. In a short time a temperature of 1800°F. or more is attained throughout the fire box. The "Red Devil No. 20" is 15" long and 7" high with a fire box 5" wide, 4" deep and 5½" long. The burners are said to represent advanced design, their tips being non-sticking and easily adjusted. The curved and hinged hood is quickly removable. In spite of its small size, this new furnace has a comparatively large capacity—being capable, it is said, of heating a pair of 10-lb. soldering irons in 5 minutes.

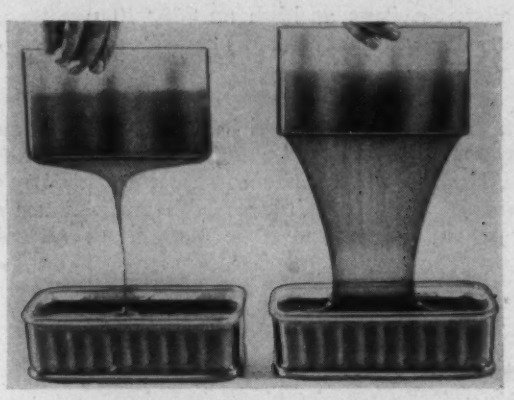
Automatic Weld Timer

For use in connection with resistance welding machines, The Electric Controller & Mfg. Company, Cleveland, Ohio, announce an automatic weld timer. This timer does not provide a definite amount of time for each weld, but varies the time automatically in inverse proportion to the rate of current flow to produce a 100% weld at each operation. When installed and adjusted for the range of work at hand, it is claimed with this new device that each weld will be perfect and all welds will be uniform regardless of fluctuations in line voltage, condition of electrodes, variations in thickness of material, amount of rust, dirt, scale, etc. Reports from companies using this timer who have tested welds secured on ordinary black sheets indicate that, in many cases, they can greatly reduce their cost of production by using these sheets in place of the more expensively finished sheets. The original adjustment of the timer is easily made by welding a few scrap pieces of the work to be done and then these welds are torn apart for inspection. When the desired weld is obtained, the cabinet door of the timer may be locked and for all practical purposes within reasonable limitations, it will not be necessary to readjust the timer; the first weld obtained being identically the same as the last one at the end of the day's run. For the exceptional case, however, the adjusting dial on the weld timer can be changed to suit the particular condition. The standard type of automatic weld timer is shown in the attached illustration. It consists of a rectifier tube which charges a fixed condenser in proportion to the rate of current flowing in the welding circuit. When the charge reaches an amount sufficient to pass current through two neon-gas-filled tubes, a small relay is operated which in turn opens the relay controlling the main line contactor. The tubes are in the circuit only when the welding current is on so that as soon as the main welding circuit is opened, the weld timer is ready for the next operation.



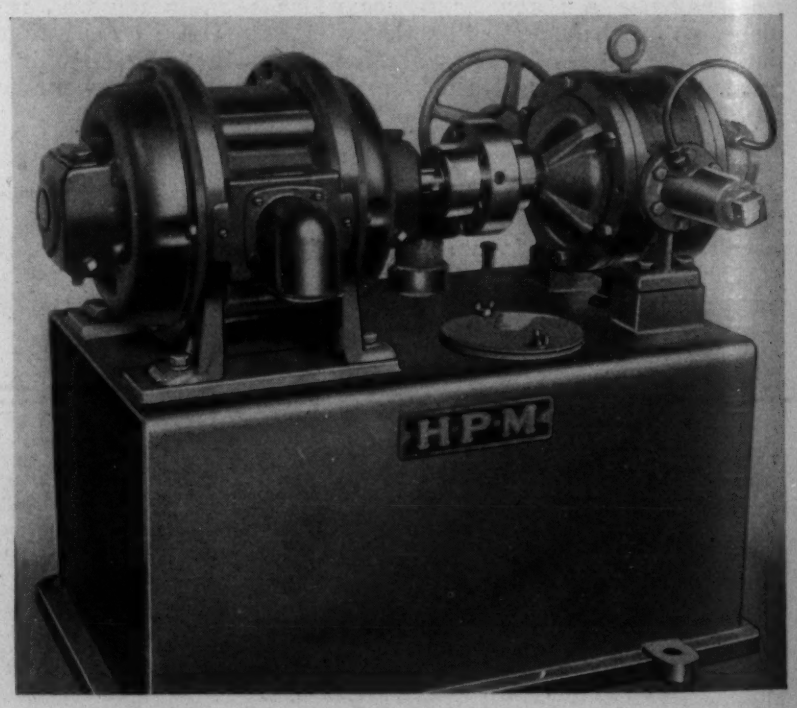
New Process Lubricants

An interesting new series of industrial lubricants which have unusually high film strength due to a special polymerization treatment were recently announced by the Research Staff of E. F. Houghton & Co., Philadelphia, Pa. These new products, known as STA-PUT LUBRICANTS, are made of pure mineral oil which is polymerized under carefully controlled heat and pressure. It is claimed this treatment results in a complete re-arrangement of the molecules of the oil without any change in its chemical content, thus producing a much closer bond between all of the molecules and a consequent increase in film strength. Actual tests indicate that this treatment increases the film strength of these oils 40% to 65%. In addition, they cling to the bearing surfaces and do not drip or spatter as easily as ordinary mineral oils. STA-PUT lubricants are made in 3 series and are available in grades for nearly every type of industrial equipment. The 300 series are liquid, ranging in consistency from light machine oils for high speed spindles to heavy oils for slow moving bearings and extremely high loads. The 400 series are made especially for gear lubrication. Several grades have been developed for all types of gears to meet any condition of speed and load. The 500 series are grease consistency and are made for screw-down grease cups, automatic grease lubrication systems, etc. They feed freely through any system and being moisture free they will not separate, harden or turn rancid under any conditions.



Power Units for Self-Contained Hydraulic Machine Drives

To facilitate the application of the new H-P-M Radial, Oil Pressure Pumps to various types of hydraulically actuated machines, a line of standardized H-P-M Hydro-Power Units has been developed by The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. Each Hydro-Power Unit incorporates an H-P-M Radial Pump Pressure Generator, direct driven from an electric motor through a flexible coupling. Both pump and motor are mounted on a base which is made of steel plate, neatly formed and welded. This is completely enclosed so as to also serve as a reservoir for the oil used as pressure fluid and lubricant. This reservoir is completely equipped with all essential accessories including removable end cover, covered filling strainer, air vent filter, level gage and drain valve. It is also fitted to take a copper coil for cooling water circulation when operating conditions require auxiliary oil temperature regulation. The pressure output of the radial pump is regulated by an automatic control which may be adjusted for any value within the operating limits up to 3000 lbs./in.^{2} A modified form of this control is provided with a second adjustment whereby the volume of pump discharge may be regulated to any amount from zero to maximum.



GENERAL (0)

The Trend of Metallurgical Research. R. T. Rolfe. *Metal Industry*, London, Vol. 42, Jan. 1933, pages 65-67, 70. The recent development of physical metallurgy is reviewed with particular reference to the stimulus it received from over-production, international competitions and the demand for lightness and strength. Corrosion problem, cathodic and anodic coating of metals and testing methods by X-rays are briefly discussed. Ha (0)

Modern Steel Developments. L. Sanderson. *Electrical Review*, Vol. 111, Sept. 2, 1932, page 320. Outlines recent advances that interest the electrical engineer. One of the most striking is in steels for permanent magnets, particularly those containing Co in percentages varying from 3 to 35%. Another is the development of steels suitable for the Al die-casting industry. These contain Cr in high proportions together with other alloys. Corrosion-resistant steels such as the 18-8 Cr-Ni are being used in electric appliances. For purposes requiring a silver finish as well as corrosion resistance, there is being produced a series of steels containing 17-19% Cr, 5-10% Mn, and Cu or Cu and Ni in small percentages. High-frequency induction furnace is finding increasing use for the manufacture of fine tool-steels. MS (0)

Relations Between Designer and Producer. L. H. Pomeroy. *Journal Institution of Production Engineers*, Vol. 12, Feb. 1933, pages 43-58. Includes discussion. The production engineer can assist the designer by suggesting economical methods of manufacture, and advising on manufacturing tolerances. Selective assembly is often better and cheaper than an attempt to maintain close limits and absolute interchangeability. The use of soap films for determining stresses in complex machine parts is briefly described, the bad effect of sharp corners being illustrated. JCC (0)

A Comprehensive Treatise on Inorganic and Theoretical Chemistry. Vol. XII. U, Mn, Ma, Re, Fe (Part 1). J. W. Mellor. Longmans, Green & Co., New York, 1932. Cloth, 6¼x9¾ inches, 944 pages. Price 3£ 3s. Unless the metallurgist is used to using previous volumes of Mellor as a reference work, he may think from the title that this volume is of no particular interest to him, since he may not care much about the reactions of metal salts. As a matter of fact, the volume is of first importance to the ferrous metallurgist. While the sections on uranium, manganese, masurium and rhenium contain information on these metals and their alloys, beside the chemical data, the last half of the book is concerned with the metallurgy of iron and carbon steel. The chemistry of the salts of iron is not included in the present volume.

But about the only thing missing from this volume, in which the ferrous metallurgist is much concerned—and it will be included in the next volume—is the discussion of corrosion and oxidation.

That any individual who has not spent his life in metallurgical work, even with the chemical and ceramic background of Mellor, and with the help of any number of assistants, could so well, so completely and so authoritatively cover the metallurgy of iron, is amazing.

The section on iron covers its history (in an entertaining fashion); the occurrence of the ores; the extraction of the metal from ores from primitive to modern times, with comment on slags; the chemistry of the blast furnace process; the Fe-O-C system; and brief chapters on manufacture of wrought iron, of steel, and of so-called pure irons. The rest is physical metallurgy, and deals with annealing, hardening and tempering, normal and abnormal steels, split transformations, both sides of the amorphous metal controversy, slip-interference, phenomena in separation of martensite, temper brittleness, nomenclature, cast iron and the effect of Si, malleable iron and its preparation, carburization, allotropy of iron, discussion of critical points, microstructure and etching. Also, the Fe-C equilibrium diagram—stable and metastable—and the effect of Si, metallographic constituents of steel, retained austenite, body centered tetragonal and face centered cubic martensites, troostite (with micrographs from Lucas), cementite, etc., with comment on damascus steel, crystallization and lattice structure, Newmann bands, Lüders lines, grain size, grain growth and annealing.

Thousands upon thousands of references are given. Nobody can have personally read all of them, but Mellor has studied enough of them, or of summaries made by his assistants, to give a very fair appraisal of even the controversial points of the physical metallurgy of iron. When a theory is fantastic, he gives it but a word and appraises it as fantastic, but when there are two or more well-supported sides to a question, he gives them all, but manages to put most emphasis on those that are probably the most generally accepted.

The latter half of this volume would take most qualified authors ten years to write, no matter how much assistance he had. We can't see how Mellor does it, but we're very glad he does. The whole series of books is indispensable in any chemical or metallurgical reference library, and this particular volume will be indispensable to the individual ferrous metallurgist. H. W. Gillett (0)-B-

Standards Yearbook 1933. Compiled by U. S. Bureau of Standards. Superintendent of Documents, Washington, 1933. Cloth, 6x9¼ inches, 255 pages. Price $1.00. This is the 7th issue of this yearbook. It gives no actual standards but describes the various standardizing bodies and gives an idea of the mechanism by which standards are set up throughout the world. Information is included as to the standardizing activities of 17 international associations or committees, 11 national standardizing laboratories, the national industrial standardization bodies of 21 countries and the efforts of some 58 different U. S. Government bureaus, commissions and agencies, and of states and counties to standardize in purchasing. The standardization work of the Bureau of Standards is outlined.

There are given the names, addresses and objects of some 300 technical and trade associations having to do with standardization in one way or another.

Naturally only a small proportion of the book is devoted to metallurgical standardization since the subject is covered broadly. There is a bibliography of articles dealing with standardization in its broader aspects. H. W. Gillett (0)-B-

Standards and Specifications for Metals and Metal Products. G. A. Wardlaw. Bureau of Standards Miscellaneous Publication No. 120. Superintendent of Documents, Washington, 1933. Cloth, 8x11 inches, 1359 pages. Price $3.00. In this bulky volume there are collected the standard specifications for metals and metal products (other than machinery, vehicles and electrical supplies) put out by all organized specification-making bodies in the United States, such as the Federal Specifications Board, A.S.T.M., A.R.A., etc. The specifications cover not only ingots, castings, and raw wrought shapes, but also many finished articles made therefrom, as to both quality and dimensional standards. To pick a very few from the long list, one can find the types of nails, rails, springs, saws, gages, plumbing fixtures and what not, that are in wide enough use so that specifications for them have been prepared.

A very large proportion of the contents are taken from the A.S.T.M. specifications, but even to one who has those specifications, this volume will be very convenient since the question often arises whether other nationally accepted specifications differ from those of the A.S.T.M. or whether there is a specification for something not yet covered by the A.S.T.M. Even this does not give all the information the metallurgist often needs, since the specifications of foreign standardizing bodies and of particular firms, such as individual railroads, for example, are not given. Nevertheless, it contains far more information on the subject than has ever been brought together before and will be a very great convenience to the metallurgist.

It contains much information on recommended practice, on methods of testing, and on methods of chemical analysis.

It will be the first place to look for a great deal of information, and as soon as one has leafed it over enough to get an idea of the type of material it contains, it will become one of the most useful volumes in any American metallurgical library.

Since it is sold at the cost of printing and binding, its price is absurdly low compared to the ordinary reference volume. H. W. Gillett (0)-B-

PROPERTIES OF METALS (1)

The Atomic Weight of Lead from Bedford Cyrtolite. Gregory Paul Baxter & Chester M. Alter. *Journal American Chemical Society*, Vol. 55, Apr. 1933, pages 1445-1448. Experimental result of this research is that atomic weight of uranium Pb from a specimen of cyrtolite is 205.92 ± 0.02. MEH (1)

Properties of Rare Metals. (Eigenschappen van zeldzame metalen.) *Polytechnisch Weekblad*, Vol. 26, Dec. 8, 1932, page 785. Ga: m.p. = 300° C., boiling point = 2000° C., occurring in ZnS, used in quartz thermometers, optical mirrors and alloyed with Al in metal vapor lamps. Ge: m.p. = 910° C., Mohs hardness = 6.25, occurs as GeO_2 utilized in Duralumin in amounts of 1.2-1.6%. Sc: m.p. = 1200° C., boiling point = 2400° C. In: found in conjunction with Ga and Ge in ZnS, m.p. = 155° C., boiling point = 1450° C., employed in quantities of 0.5-3.5% in a special bearing alloy. Ti: occurrence = TiO_2 and $FeO \cdot TiO_2$ as rutil and ilmenite respectively, m.p. = 1800-1850° C., very hard and brittle, widely used as ferro-titanium and alloyed with Cu, Mn, Co and Ni. A 10/90 TiCu and 30/70 TiMn alloy is used for deoxidation of brass and bronze. WH (1)

Tin and Its Alloys. *Tin*, Dec. 1932, pages 5-7. Importance of tin in industry is pointed out which makes it rather a misnomer to speak of it as a base and a rare metal; it is, however, indispensable for a great many purposes for which there exists no real substitute. Most important Sn alloys are briefly mentioned. Ha (1)

Atomic Moments of Some Metals. P. Weiss. *Nature*, Vol. 129, Jan. 16, 1932, page 95. Experiments on the magnetization to saturation of solid solutions of metals in Ni and Co, in intense fields and at low temperatures, are discussed and graphically illustrated. It was found that numerous metals possess ferromagnetic moments, the magnitude of which was determined. Kz (1)

Comparative Properties of Oxygen-Free High-Conductivity, Phosphorized and Tough-Pitch Coppers. W. R. Webster, J. L. Christie & R. S. Pratt. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 30, Feb. 1933, 4 pages. New tensile data given is on O-free Cu. Properties of Cu cold worked to various degrees and annealed at various temperatures are given in curves. The O-free Cu had a much higher reduction of area in tensile tests than any of the other coppers. Its annealing temperature was much higher than electrolytic Cu. The other tensile properties of O-free Cu did not differ materially from those of the other materials. The scale does not tend to flake off from O-free Cu as readily as from tough-pitch Cu. JLG (1)

The unusual metal or alloy of today may be the usual metal of tomorrow.

You will profit by looking over this section as well as the sections on non-ferrous and ferrous alloys.

Properties and Applications of Nickel and Its Alloys. (Proprietes et Applications du Nickel et de ses Alliages.) L. Guillet. *Genie Civil*, Vol. 100, June 18, 1932, pages 613-617; June 25, 1932, pages 633-639. Properties and applications of Ni and its alloys in use at present are reviewed. Ha (1)

Measurements of the Solid Viscosities of Metals Through the Flexural Vibrations of a Bar. Katsutada Sezawa & Kai Kubo. *Aeronautical Research Institute, Tokyo Imperial University*, Vol. 7, Dec. 1932, pages 195-231. Present investigation aimed at experimental determination of coefficients of solid viscosities of Al, duralumin, Cu and brass by means of the flexural vibrations of a bar, resistance of a solid body due to damping being assumed to be proportional to velocity of deformation of that body. In analyzing results, mathematical formula, deduced by one of authors a few years ago (Katsutada Sezawa, Aeronautical Research Institute, Tokyo Imperial University, Vol. 4, Nov. 1928, pages 83-147) was employed. Experiments showed the coefficient of solid viscosity is as small as 10^6 in C. G. S. units. This suggests that resonance condition of a flying machine is detrimental to its behavior, as no dissipation energy is radiated outwards from its boundary, while, at the same time the damping due to internal viscosity is too small in such a body. The experiments also showed that the damping constants of metals, even in such a high vacuum as 1/200 mm. Hg depends on the amplitude of the vibrations. The greater the amplitude, the greater becomes the coefficient of solid viscosity. Kz (1)

Influence of Deformation and Annealing upon the Coefficient of Expansion of Copper. (Einfluss des Verformens und Anlassens auf die Wärmeausdehnungszahl des Kupfers.) H. Sieglerschmidt. *Zeitschrift für Metallkunde*, Vol. 25, Feb. 1933, pages 38-42. Cu used contained 0.02% As, 0.02% Fe, 0.07% Ni, and 0.05% O; traces of Pb, S, and Bi. Cold-work (compression and elongation, respectively) increases the coefficient of thermal expansion. The increase in the coefficient partly disappears on heating to 150° C. and reaches its normal value after heating to 300°. Although recrystallized Cu shows a preferred crystal orientation ("recrystallization texture"), the coefficient of thermal expansion is not, or very little, dependent upon the direction of measurement. The increase in the coefficient of thermal expansion probably is caused by the internal elastic strain introduced by the cold work. RFM (1)

Researches on Beryllium. H. A. Sloman. *Metal Industry*, London, Vol. 41, Sept. 23, 1932, page 299; Oct. 14, 1932, pages 369-372; Oct. 21, 1932, pages 397-400; Oct. 28, 1932, pages 417-418. See *Metals & Alloys*, Vol. 4, May 1933, page MA 132. Ha (1)

A. C. Characteristics of Metallic Arcs. Pt. I. (Über die Wechselstromcharakteristik von Metallichtbogen I.) J. J. Sommer & J. Bott. *Physikalische Zeitschrift*, Vol. 34, Apr. 15, 1933, pages 324-330. Although many studies have been made on d.c. characteristics of metallic arcs, a.c. characteristics have not been thoroughly studied. The author gives a detailed description of experiments on Fe, Cu, Zn and Mg. Graphic presentation of the limiting current density in relation to gas pressures for the various metals shows that the curves for the metals can not be arranged in a regular series, and that the results deviate from those according to the thermal arc theory. RRS (1)

The Magnetic Susceptibilities of Some Paramagnetic Substances. W. Sucksmith. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 14, Dec. 1932, pages 1115-1126. Describes an apparatus for measurement of magnetic susceptibilities at temperatures above and below room temperatures. Deflections are kept very small so that linear relationship exists between deflecting force and resulting displacement. Substances on which measurements were carried out divide themselves into 2 classes, some oxides of rare earth group, and U and Mo. Rare earths investigated were Neodymium, Samarium, Europium, and Ytterbium. Measurements on these confirm theory of Van Vleck. Data on Mo and U salts indicate that paramagnetism of these substances is due to spin moment only. Gives thorough description of apparatus and methods and discussion of results. Several tables present condensed summary of results. RHP (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

A Third Survey of Dental Amalgam Alloys. GEORGE C. PAFFENBARGER & W. T. SWEENEY. *Journal American Dental Association*, Vol. 20, Apr. 1933, pages 649-652. 35 brands from 21 manufacturers were purchased in open market and tested to see if they met specification No. 1 of the American Dental Association. The principal tests were for dimensional changes on setting and for flow under pressure. Of 32 brands reported 22 met the specification. Only brands claimed to meet the specification were considered. The work was done at the Bureau of Standards by research associates. 6 references. OEH (2)

Zinc Alloys for Die Castings Recently Improved. J. B. NEALEY. *Metal Progress*, Vol. 22, Dec. 1932, pages 43-46. The varieties and properties of dies are discussed. A new Zn alloy of 4% Al, 3% Cu, and 0.10% Mg is described. The physical properties of this alloy and several modified alloys are tabulated. Changes after casting are described with a method of heat treating to overcome them. Effect of aging treatment on tensile and impact tests is shown graphically. WLC (2)

Study on Hardening of Zinc-aluminum Alloys of the Composition Al_2Zn_3. (Vergütungsuntersuchungen an der Zink-Aluminium-Legierung von der Zusammensetzung Al_2Zn_3.) HERBERT MEYER. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 2, 1932, 50 pages. Describes a detailed study of changes resulting from "aging" of quenched alloys at several temperatures. No hardness values are given. Alloys contained 79% Zn and 21% Al. Some contained 0.1 or 0.2% Mg or Cd. When quenched alloys are aged at 20° or 50° C. resistance increases to a maximum and then gradually decreases. The time to reach maximum decreases as temperature is raised and subsequent decrease takes place more rapidly. Mg and Cd tend to slow down reaction rates. When aged at 0°C. the resistance increases asymptotically. When aged for short periods alternately at a high and a low temperature (95 and 0° C., 95 and 50° C., etc.) the resistance change at each temperature was somewhat independent of the changes at the other temperature. There is a good difference between the coefficients of the annealed and quenched alloys. It was concluded that 2 different and independent reactions occurred when the alloys were aged. One caused a decrease in resistance and the other an increase. 7 references. JLG (2)

Machinability of Free-Cutting Brass Rod, II. ALAN MORRIS. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 28, Feb. 1933, 5 pages. Machinability was determined by the previously described impact method. Additions of up to 0.25% Sn to a 60:40 annealed leaded brass had little effect on hardness or resistance to cutting. Further increase in Sn slightly increased hardness and cutting resistance. Additions of up to 0.5% Fe increased hardness and decreased cutting resistance of the annealed brass. Varying the Cu content from 58 to 63% had little effect on cutting resistance of either annealed or cold worked brass. When the Cu increased to 64 or 65% cutting resistance increased. JLG (2)

Fabrication and Properties of Seamless Phosphorized Arsenical Copper Tubing. G. L. CRAIG & O. Z. KLOPSCH. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 15, Feb. 1933, 9 pages. Phosphorized Lake, electrolytic, and Lake Cu containing as much as 0.20% As were drawn into tubing of various sizes. No difference in power required to draw was observed for the several materials, and no difficulty was encountered in drawing any of them. Tests on cold-drawn and annealed tubing showed that As slightly increased strength, but did not affect ductility. JLG (2)

Graphitic Silicon, Heat-treatment, and the Electrical Conductivity of Aluminum. L. H. CALLENDAR. *Institute of Metals, Advance Copy* No. 626, Mar. 1933, 8 pages. "Graphitic Si" is free Si in metal. It was supposedly determined by dissolving metal in 2:5 HCl, filtering, treating precipitate with 40% NaOH and determining H evolved. It could not be proved that this method actually determined the correct amount of free Si in Al, but it is probable that it does. Electrical conductivity and analyses by the method described showed that on aging, Si precipitates in Al and the conductivity increases. 9 references. JLG (2)

Bronzes, Brasses and Atmospheric Corrosion. (Bronzes, Laitons et Corrosion Atmospherique.) DUBERGET. *Revue de Fonderie Moderne*, Vol. 26, Oct. 25, 1932, pages 407-408. A brief review of qualities and new compositions of bronzes and brasses with outstanding corrosion resistance; modern brasses are equivalent to bronzes, that is Cu-Sn alloys. Ha (2)

Free-cutting Brasses. *Machinery*, London, Vol. 40, May 12, 1932, pages 169-171. Free-cutting brasses with a good range of mechanical and physical properties are in the α-β group, capable of being hot worked by rolling, extruding and stamping. These brasses have a Cu content ranging from 53 to 63% and are dependent for their special properties on elements added. Pb produces free-machining properties if evenly distributed in a finely divided state throughout the alloy. Ni content up to 2% improves ductility without appreciably affecting strength. Ni assists in giving a refined structure and a denser material and increases solubility of Pb in Cu. Si added to brass affects structure to an extent equal to about 7 times that of Zn; machinability is same as before, ductility of this alloy is slightly lower but it possesses greater abrasion resistance. A curve shows the relation between temperature and hardness of free-cutting silicon brass. Particulars of mechanical tests carried out on the 3 brass alloys are given and gathered in tables. Stress-strain curves of the alloys accompany article. Kz (2)

Aluminum-brass Condenser Tubes. *Mechanical World & Engineering Record*, Vol. 92, July 29, 1932, pages 106-107. "Alumbro" is an Al brass produced by the I. C. I. Metals Ltd. In pouring, the aluminum-oxide film on the surface of the molten metal becomes broken up, inclusions are formed, leading to flaws in the casting. An improved method of casting has been developed. The alloy 76/22/2 (Cu, Zn, Al) is highly resistant to impingement attack, to corrosion, and oxidation at high temperatures. When immersed in sea water it forms a natural vitreous scale, adherent and rehealing. The properties of "Alumbro" are claimed to depend on the composition and method of manufacture. Solid cast billets are heated and pressed into a hollow shell in a new type of high-pressure extrusion press. The extruded shells are cold-drawn into tubes by a series of drafts between which the tubes are annealed. "Alumbro" has a tensile strength of 40.7 tons/in.^{2}, elongation in 2 in. 10.5%, Brinell hardness 136. Kz (2)

Static and Dynamic Properties of Light Metals. (Statische en dynamische Eigenschappen van lichtmetalen.) *Polytechnisch Weekblad*, Vol. 26, Nov. 24, 1932, pages 744-745. 7 tables are presented in which chemical analyses, static and dynamic properties of some 16 Al and Mg alloys are given. The data mainly refer to investigations of Matthaes and Saran respectively. WH (2)

Beryllium and Its Alloys. (Le béryllium et ses alliages.) *La Revue de Chimie Industrielle*, Vol. 41, Oct. 1932, pages 278-281. Great hardness (harder than glass), low specific weight of 1.84 and high m.p. of 1285° C. of pure Be are emphasized. Commercial purity is given as 98% (1% Fe). Remarkable deoxidation power is stressed resulting in a replacement of P. Conductivity of electrolytic Cu = 60, Cu deoxidized with P = 44, Cu deoxidized with Be = 56. The maximum addition of Be to Cu, Ni, Fe or Co is 3%. Brinell hardness of Cu-Be is raised from 100 to 400 due to 2.5% Be. Stress is laid on fatigue resistance due to presence of Be. Be-Ni and Be-Co alloys are exceedingly hard and heat resistant. In Fe, additions of 1% Be + 4% Ni raise hardness to 600 Brinell while 680 Brinell is attained by 20/5/1 Cr-Ni-Be. Balance of paper deals with commercial use of Be alloys. WH (2)

Can Brinell Hardness give Some Indication as to Wear of Brass and Bronze Castings? (Kann der Brinellhärtewert etwas über die Verschleissfestigkeit von Messing und Bronzeguss aussagen?) F. BROBECK. *Die Giesserei*, Vol. 19, Nov. 25, 1932, page 481. Tests made on worn gears of red brass and brass of different hardness permit conclusion that hardness can not be considered as giving any indication for resistance to wear; no connection between 2 exists. This should be taken into account in specifications for a material. Ha (2)

PROPERTIES OF FERROUS ALLOYS (3)

Magnet Steels and Permanent Magnets. R. L. SCOTT. *Transactions American Institute of Electrical Engineers*, Vol. 51, June 1932, pages 410-417. Includes discussion. Relationships of magnet steels and permanent magnets among their magnetic properties were studied and experimental data are given showing saturation, remanence, and induction in relation to residual induction Br and coercive force Hc, and the influence of straight and bent shapes on these properties. Tests and evaluation methods are described. Ha (3)

Common Machinery and Structural Cast Iron. (Das gewöhnliche Maschinen- und Bau-Gusseisen.) L. SCHMID. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Apr. 2, 1933, pages 130-131. Discusses chemical composition, composition of melting charges and requirements which such cast irons have to meet. Tables show average chemical composition for various parts of variable wall thicknesses and compositions of charges for common machinery cast Fe, foundation plates and for a generator casing. GN (3)

A Contribution to the Study of the Properties of Austenitic Steels. L. B. PFEIL & D. G. JONES. *Iron & Steel Institute, Advance Copy* No. 10, May 1933, 42 pages. Reports results of an extended study of hardening on cold working, softening temperatures, and weld decay of corrosion-resistant Ni-Cr steels. Rate of work hardening was determined by cold rolling to different reductions and determining hardness. Alloys containing 18% Cr and from 8 to 29% Ni were used. Rate of work hardening decreased rapidly as Ni was increased from 8 to 12%. Further reduction in rate occurred as Ni was increased to 15%, but the change was small on increasing Ni from 15 to 29%. In 18-8 alloys increasing C from 0.04 to 0.1% greatly increased rate of hardening. In 18-15 alloys the C had less effect. Small amounts of Mo, Ti, or Si increased hardness of the annealed alloys but decreased rate of hardening on annealing. Softening of work-hardened steels, with few exceptions, occurred gradually as annealing temperature was raised. Increased C increased the temperature required to give a given hardness. With increasing Ni the softening temperature was lowered. In all but the 18-8 steels, hardness was increased by annealing at 550°C. Proclivity to weld decay was determined by heating samples to 650°C. for either a few minutes or 2 hr., boiling in $CuSO_4$-H_2SO_4 solution and determining electric resistance. Welded specimens were also tested. Some of the steels contained Mo, Ti, or Si. Decay was dependent on annealing temperature used prior to reheating to 650°C. With low annealing temperature weld decay was usually absent. Mo, 4%, was effective in preventing decay in samples annealed at very high temperatures and reheated for a brief period at a lower temperature. 22 references. JLG (3)

Hereditary Properties of Certain Types of Pig Iron. (Erbliche Eigenschaften gewisser Roheisensorten.) E. PIWOWARSKY & H. NIPPER. *Die Giesserei*, Vol. 20, Feb. 3, 1933, pages 41-45. Very exact tests are described which were to determine whether certain properties of pig iron are hereditary, that is, maintained when the iron is remelted and cast later; this question is of importance in view of the fact that often 2 kinds of iron almost identical in composition may still have considerably different mechanical properties. The tests, however, did not reveal any conclusive evidence as irons of different origin but similar composition behaved almost alike. There might be, however, an influence exerted by the manner in which a pig iron conserves its content of C, due to its structure and chemical composition. Ha (3)

The Precipitation Hardening of Copper Steels. CYRIL STANLEY SMITH & E. W. PALMER. *American Institute of Mining & Metallurgical Engineers, Abstract*, Feb. 1933, 5 pages. An extended abstract with illustrations of a paper presented at the annual meeting. The steels used contained from 0.03 to 0.46% C and as much as 5% Cu. Cooling the alloys from 800 or 900°C. at various rates proved that even comparatively slow cooling served as a quench, as the Cu remained in solution and precipitation hardening resulted on reheating. Precipitation hardening also resulted when the alloys were cooled to between 450° and 550°C. and then held for several hours. Precipitation hardness was observed in even the 0.45% C steels. Hardness and tensile values of the alloys given various treatments are given in curves. When a low-C Cu steel that had been hardened by cold work was annealed its strength remained unchanged while the elongation in 2" increased from 1.8 to 12%; the hardening due to precipitation had counteracted the softening due to loss of cold work. It is suggested that the Cu steels are attractive because they can be hardened by simple reheating of a normally cooled section to 500°C. JLG (3)

Tool Steels Differ in "Personality" or "Timbre." B. F. SHEPHERD. *Iron Age*, Vol. 129, Apr. 21, 1932, pages 916-919; *Mechanical World & Engineering Record*, Vol. 91, May 27, 1932, pages 507-508. Based on paper read before New York Chapter of A.S.S.T. shows hardening irregularities in tool steel, the effect of timbre, between products of several manufacturers by means of hardenability or timbre test developed by the author, and degree of abnormality, with illustrations showing that timbre exists not only in tool steel but also in various alloy steels. Timbre is defined as inherent property of tool steel independent of analysis which influences degree of hardness penetration and width of allowable quenching range. Kz+VSP (3)

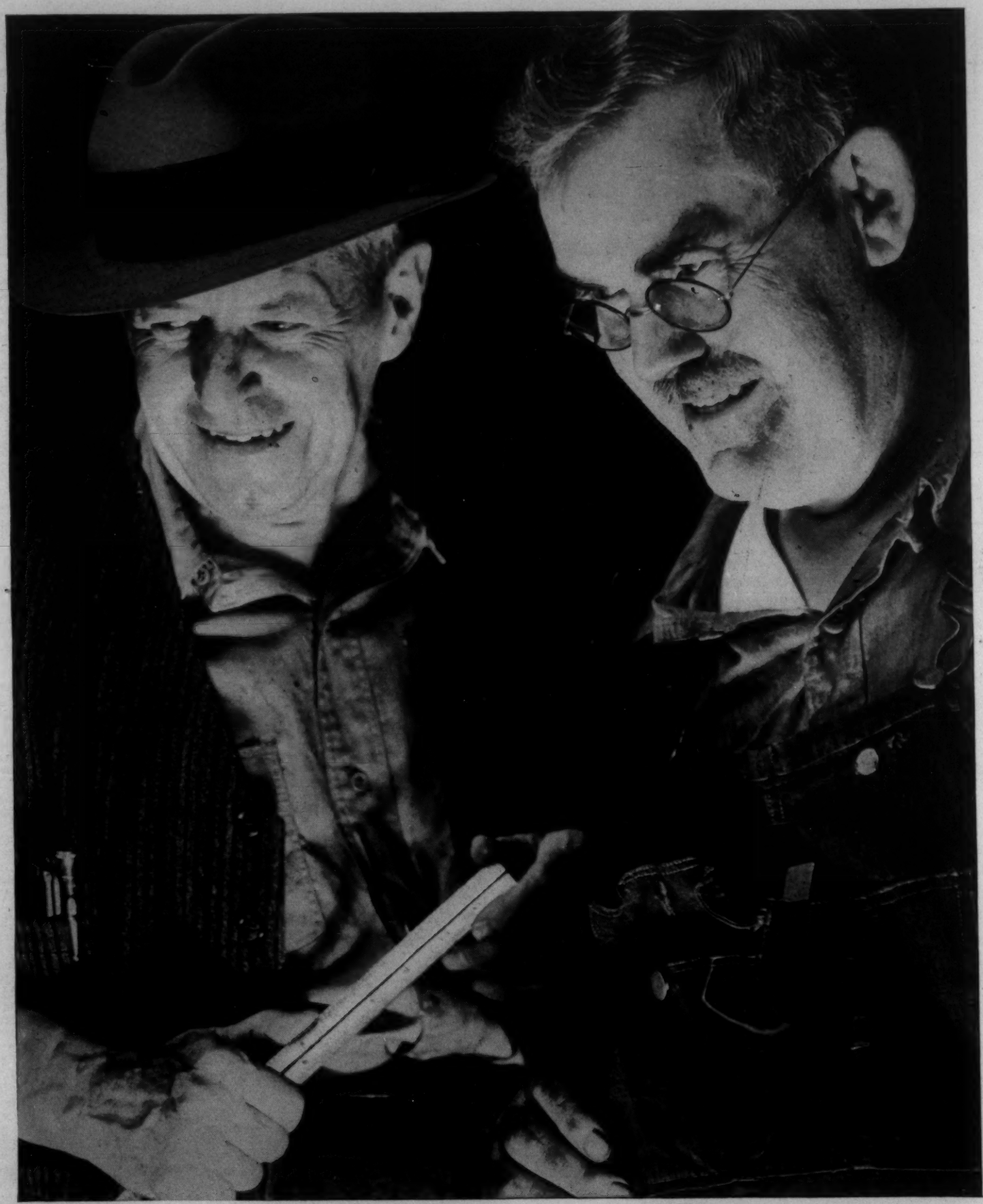
Illium. W. D. STALEY. *Product Engineering*, Vol. 3, Nov. 1932, pages 456-457. Illium is a non-ferrous alloy of the Ni-Cr-Cu ternary system with very small quantities of Mo, W, Si, C, Mn and Fe. It was used as a material for calorimeter bombs in which very corrosive materials were generated during combustion. Tests with acids, salts and organic substances at low and high temperatures were made and only extremely weak action was found. The tensile strength of Illium is given as 60,000 lbs./in.^{2}, elastic limit 50,000, Brinell hardness 170-200, melting point 2372°F., density 8.3, specific heat 0.105 cal./°C., expansion coefficient/°C. between 20° and 300°C. is 0.0000735, the electrical resistance is 121.9 microhms/cm.^{3}, contraction in casting $\frac{5}{16}$"/ft. Its machinability is slightly harder than cast steel. It can readily be welded to other metals by acetylene or the electric arc. In appearance it resembles Cr. Ha (3)

Refined Pig Irons. J. E. HURST. *Metallurgia*, Vol. 7, Feb. 1933, pages 115-116. Irons with properties similar to those of cold-blast irons can be made by proper blending of refined irons. Properties of some English irons are given. Alloy irons are being more widely used. Alloy additions should be made by means of a high-C low-alloy material. JLG (3)

A New Alloy "Stainless-Invar." K. HONDA. *Nature*, Vol. 131, Apr. 22, 1933, page 587. Investigating alloys which have a small coefficient of expansion, the author found an alloy containing 63.5% Fe, 31.5% Ni, and 5% Co which has a smaller coefficient of expansion than that of fused silica. Research on Fe-Co-Cr alloys led to an alloy containing 36.5% Fe, 54.5% Co, and 9% Cr which has a coefficient of expansion less than 10^{-7} and an alloy of similar composition having a negative coefficient of -1.2×10^{-6}. These alloys are corrosion resistant. Kz (3)

The Wearing Properties of Old Rails. R. J. M. INGLIS. *Railway Engineer*, Vol. 53, Jan. 1933, pages 14-18. Investigation of analysis and physical properties of some 40-50 year old rails still carrying traffic of London and North Eastern Railway led author to conclusion "that it is rare to find in any modern rail such a combination of hardness, toughness and ductility as that exhibited in some of early rails figuring in these tests." Micro- and macro-structure of different rails are shown and results of tests which included falling weight, tensile, Izod impact and Brinell hardness tests are compiled in tables. WH (3)

Make a Metal to Fit the Job. E. W. HARDING. *Iron & Steel of Canada*, Vol. 16, Apr. 1933, pages 57-59. Molding and metal bath provided problems when making certain grinding plates. Alloyed white cast iron, having a Brinell hardness up to 600 in sand and 700 in chill, was used, and 2 photomicrographs show its structure. The development of a metal for heavy-duty brake drums provided another problem successfully solved. OWE (3)



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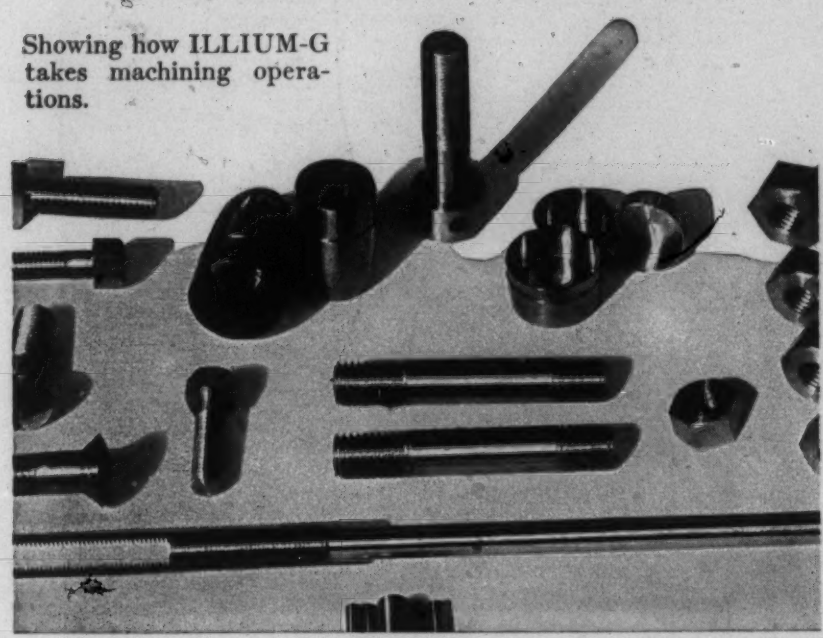

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CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION (4)

Stressless Corrosion Followed by Fatigue Test to Destruction on Aluminum Crystal. H. J. GOUGH & G. FORREST. *Reports & Memoranda, Aeronautical Research Committee, British Air Ministry,* No. 1476, 1933, 11 pages. Experiments on a single crystal of Al were carried out to show whether corrosion without stress occurs less rapidly than corrosion combined with stress. It has been claimed that stress and corrosion are mutually accelerative. The experiments did not bear out this claim and the suggestion is made that the loss of fatigue strength when stress accompanies corrosion is due to the rupturing or damage of the protective film by the stress rather than to an accelerated rate of corrosion on clean metal. General pitting, it is stated, is not appreciably influenced by elastic strain due to applied cyclic stresses. In the Al crystal, prior stressless corrosion, for 1000 hours in tap water, that produced pitting, did not affect the fatigue properties of the material. (This conclusion need not necessarily apply to other materials, for pitting would certainly be normally expected to reduce fatigue strength. Abstractor). HWG (4)

Recent Investigations on the Behavior of Steel Tubes Under Strong Corrosion Attack. (Neuere Forschungsarbeiten über das Verhalten von Stahlrohren bei starker Beanspruchung durch aggressive Stoffe.) F. EISENSTECKEN. *Gas und Wasserfach,* Vol. 76, Feb. 4, 1933, pages 78-84; Feb. 11, 1933, pages 95-97. Report of Research Institute of Vereinigte Stahlwerke, Dortmund. Most important protective media of steel tubes are described, results of laboratory tests on impact bending strength and corrosion properties are given, testing methods are dealt with. Corrosion by various gases, water, soil and stray currents was studied. In evaluating the tests they are compared with practical experience, remedies are discussed. In the discussion further experiences are reported and discussed. GN (4)

Progress in Methods of Preventing Corrosion. ULICK R. EVANS. *Metal Industry,* London, Vol. 42, Jan. 13, 1933, pages 77-79. Brief discussion of usefulness of research and development of ferrous and especially non-ferrous corrosion-resisting alloys. 13 references. Ha (4)

Emulsified Asphalt Industry Ignores the Depression. J. MITCHELL FAIN & ARTHUR W. HIXSON. *Chemical & Metallurgical Engineering,* Vol. 40, Apr. 1933, pages 180-183. Asphalt emulsion has found considerable use for road building, and coating and impregnating wood, stone, felt, paper and metal. It protects from corrosion structural iron and steel used for tanks, roofs, bridges, pipe, sash, etc. Panels of sheet iron covered with a 6:1 mixture of asphalt emulsion and portland cement and buried in extremely corrosive soil for a period of 2 years showed no signs of corrosion. PRK (4)

Oxidation of Metals under Influence of Friction. (Oxydation von Metallen unter dem Einfluss der Reibung.) MAX FINK & U. HOFMANN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 210, Jan. 1933, pages 100-104. Chemically pure metals of Fe, Ni, and Cu form in dry air at room temperature an oxide under influence of rolling friction which increases ordinary oxidation considerably. Cause is very likely a mechanical activation of the chemical reaction. Oxidation products were analyzed. 11 references. Ha (4)

Cylinder Liner Wear. J. HOPE HARRISON. *Engineer,* Vol. 153, May 20, 1932, pages 563-565. Abstract of paper read before Diesel Engine Users Association, Apr. 28, 1932. Outlines theories as to cause of cylinder liner wear. Liner wear may be caused by improper lubrication, excessive pressure exerted by piston rings on liner, or by use of unsuitable fuel. Briefly discusses various wear-resistant materials suggested by metallurgists as suitable for cylinder liners. LFM (4)

A Method of Increasing the Wear Resistance of Cast Iron. ICHITARO TAKABA. *Journal Society of Mechanical Engineers,* Tokyo, Vol. 35, Dec. 1932, pages 1180-1190. Paper read at 2nd General Meeting, Society of Mechanical Engineers, April 7, 1932. Experiments on cast iron at various temperatures proved that the resistance to wear increases, whereas the structure and mechanical properties remain unchanged in ordinary atmospheres at 500° C. This fact is attributed to internal oxidation by atmospheric oxygen. Use of a protective film such as iron oxide on the iron surface is proposed. Kz (4)

Degree of Rusting and Its Practical Importance. (Der Rostgrad und seine praktische Bedeutung.) HANS HEBBERLING. *Bautechnik,* Vol. 11, Mar. 24, 1933, pages 146-148. Rust protective paints are valuated by so-called "open air" tests. Since results of such tests may be affected by individual errors it seems advisable to numerically standardize degree of rusting. Paper deals with rust scale of "Deutscher Verband für die Materialprüfungen der Technik." In this scale degrees of rusting are classified in so-called "rust groups." GN (4)

Corrosion Protection as Constructural Problem. (Der Korrosionsschutz als Bauproblem.) HANS HEBBERLING. *Bauingenieur,* Vol. 14, Apr. 28, 1933, pages 245-246. Considers influence of weather conditions upon painted constructions and its influence on the tendency to corrosion of steel. The results of tests to improve upon such paints are given. Such methods of improvement are, chemical transformation of the binding medium, passification of the metal, etc. GN (4)

Accelerated Spray-erosion of Metals. T. F. HENGSTENBERG. *Mechanical World & Engineering Record,* Vol. 42, Dec. 9, 1932, pages 553-554. Test-pieces of various alloys were inserted into the rim of an impeller disc and brought into contact with fine jets of water at high speed. At low speeds, all materials tested were resistant towards corrosion, but wide differences were encountered at high velocities. As might be expected, a hard case tends to delay beginning of excessive erosion. A curve shows loss in weight of each material after 200,000 impacts at various velocities. Kz (4)

Protecting Polished Stainless Steel During Building Construction. C. C. SNYDER. *Sheet Metal Worker,* Vol. 24, Jan. 1933, page 2. Stainless steel used for exterior decoration must be protected from "building filth;" the means are briefly described; best is a kind of lacquer, as it is more durable than paper. Ha (4)

Painted, Lacquered and Pickled Surfaces and Their Corrosion Stability. (Gestrichene, lackierte und gebeizte Oberflächen und ihre Korrosionsbeständigkeit.) P. STEEN & O. P. VAN STEEWEN. *Der Bauingenieur,* Vol. 14, Mar. 17, 1933, pages 160-162. Discusses at length corrosion stability of non-metallic coatings. Properties of paints and lacquers which affect their corrosion stability are dealt with. Furthermore some pickling solutions are given which give, besides a certain rust protection, a certain desired color to the metal surface. GN (4)

Molded Coating Halts Oil Pipe Corrosion. ARTHUR J. SWANK. *Electrical World,* Vol. 101, Jan. 28, 1933, pages 134-136. Piping network of a transformer oil-treating system developed serious leakage a few months after installation. Soil conditions were found to produce galvanic action, other conditions producing local action were also discovered. A suitable protective coating had the following conditions to meet: impervious to moisture, must be mastic and not subject to cracking, afford mechanical protection against puncture or crushing, and must be capable of economical protection. The bulk of the coating was made up of 41.8% gravel sand, 24.4% black sand, 15.5% "Somastic" asphalt, 0.9% asbestos, and 17.4% hydrated lime. The pipe was suspended from a cross-beam and the mold was hung directly on the pipe. 200′ of pipe were treated in a day and two 1 ton batches were used. CBJ (4)

Metallurgical Problems Arising from Internal Combustion Engine Valves. J. R. HANDFORTH. *Engineering,* Vol. 135, Jan. 13, 1933, pages 55-58; Jan. 20, 1933, pages 83-85. **Valve Steels.** *Automobile Engineer,* Vol. 22, Oct. 1932, pages 468-475. Condensed from paper read before the joint session of the Iron & Steel Institute and the Institute of Metals, Sept. 1932. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 103. LFM + RHP (4)

Non-Rusting and Heat Resisting 34% Chromium Alloy Cast Irons. E. HOUDREMONT & R. WASMUHT. *Metals & Alloys,* Vol. 3, Feb. 1933, pages 13-17. Translated by the authors from *Krupp'sche Monatshefte,* Vol. 12, 1931, pages 331-337. See *Metals & Alloys,* Vol. 3, July 1932, page MA 203. WLC (4)

Corrosion of Industrial Metals and Alloys by Phosphoric Solutions. (La corrosion par les solutions phosphoriques des métaux et alliages industriels.) A. PORTEVIN & A. SANFOURCHE. *Chimie et Industrie,* Vol. 27, Special Number, Mar. 1932, pages 360-365. Various tests were made on alloys to determine their resistance to phosphoric acid solutions of varying concentration and purity. Tests were also made to determine which substances in phosphoric acid attacked the metals, particularly hydrosulphuric acid. The metals studied included Zn and Mg, which were readily attacked, and Al, Sb, Cd, Cu, Fe, Sn, Ni and Pb, which were attacked in varying amounts, Pb being the most resistant. Al and Cu alloys tested, as well as some of the ordinary steels, were only slightly resistant. Of the special steels studied only the austenitic stainless steels (18:8) were resistant; the martensitic stainless steels were resistant only to the concentrated dry hydrosulphuric acid; the ferritic Cr steels were not attacked. The industrial Fe alloys, such as Fe-Cr and Fe-Si, were resistant, but Fe-Mo, Fe-Ti, Fe-W, Fe-Zn, Fe-Ta and Fe-U were all more or less attacked. MAB (4)

Corrosion of Petroleum Pipe Lines and Its Prevention. V. NEGREEV. *Azerbaidzahnskoe Neftyanoe Khozyaistvo,* Jan. 1933, pages 48-54. (In Russian.) Among a great variety of corrosion protecting compositions best results were obtained when using a mixture of 50% clay and 50% of an asphalt of 80° C. m.p. This mixture was applied to 8 inch lines connecting Baku with Batum. Pipes of a smaller diameter should be coated with a mixture having a higher content of clay. A great number of experiments is reported 54 Russian and foreign references. AAB (4)

Corrosion costs industry many thousands of dollars. Are you keeping up-to-date on this important subject?

Corrosion Protection of Idle Steam Boilers. (Korrosionsschutz ausser Betrieb befindlicher Dampfkessel.) *Apparatebau,* Vol. 45, Apr. 14, 1933, page 41. Brief description of the simple and reliable Seyb method as discussed in detail in *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 14, Jan. 1933, page 16. GN (4)

Resinous Equipment Solves Corrosion Problems. *Chemical & Metallurgical Engineering,* Vol. 40, Apr. 1933, pages 201-203. Haveg is a resin material the standard variety of which is acid resisting. Another grade has been developed for alkalies, and a new grade is resistant to both acids and alkalies. The material has been used for H_2SO_4 up to 50%; formic acid up to 40%; concentrated HCl, phosphoric even with fluosilicic acid impurity, acetic, lactic, oxalic, citric, and tartaric acids, sulphurous and chromic acids when used in the dye industry, ammonia, milk of lime, sodium carbonate, sodium sulphide, neutral soap, paraffin, CCl_4, trichlorethylene, formaldehyde, ethyl alcohol and petroleum oils. It is attacked by HNO_3, chromic acid, KOH, and NaOH. The limit in size as a single unit is 9 ft. in diameter and 9 ft. in height. Its compressive strength is 10,400 lbs./in.^{2}, bending strength 5,600 lbs./in.^{2}, and resistance to shock high. It is not affected by rapid heat changes and may be used at temperatures up to 130° C. The heat conductivity is low. PRK (4)

Corrosion of Gasworks Plant. *Gas Engineer,* Vol. 49, Apr. 1932, pages 196-198. General discussion, which includes notes on a simple paint test apparatus, calls attention to Cr alloys, influence of welding, nitriding alloys, Al-foil, corrosion resistant pipe, heat insulation, case of a pump shaft (failure of a 14% Cr steel), galvanized iron plant. Testing method for paints has been developed by Los Angeles Gas & Electric Corporation. Accelerated tests and 10 rules for procedure of measuring corrosion rate are given. WH (4)

Protection of Iron by Titanium. (Lé recouvrement du fer par le titane.) M. TRAVERS. *Chimie et Industrie,* Vol. 27, Special Number, Mar. 1932, pages 345-347. Author has studied in collaboration with M. Moundrich the protection of Fe by Ti nitride and by the deposition of Ti cathodically. By the former method the Fe shows remarkable resistance to atmospheric agents. Nothing can as yet be definitely stated about electroplating with Ti. Even at 1400° C. $TiCl_4$ alone could not be coated on Fe. A thin coating of TiN of a yellowish color was formed above 1000° C. in the presence of commercial electrolytic hydrogen because there were small amounts of nitrogen present in the hydrogen. The reaction might be used as a very sensitive test for the detection of nitrogen. $TiCl_4$ gave a blackish gray coating of Ti in the presence of hydrogen over Ca-Mg. The Ti nitride proved resistant to atmospheric corrosion in the laboratory tests (2 years' duration); to sea water in the presence of H_2O_2; and practically resistant to mineral acids and high temperatures (1000° C.). MAB (4)

Non-Rusting and Heat-Resisting Chromium Cast Iron Alloys. (Ueber nichtrostende und hitzebeständige Chromgusseisenlegierungen.) E. HOUDREMONT & R. WASMUHT. *Die Giesserei,* Vol. 19, 1932, pages 322-325. See *Metals & Alloys,* Vol. 3, July 1932, page MA 203. Ha (4)

The Passivity Produced by Chromic Acid on 18-8 Chromium-Nickel Alloy. C. G. FINK & F. J. KENNY. *Transactions Electrochemical Society,* Vol. 60, 1931, pages 235-270. Corrosion resistance of this material toward solutions of ferric chloride, calcium chloride and NaCl could be greatly increased by anodic treatment in chromic acid; local action of cutting and punching stresses could be avoided in this manner. During anodic treatment a loss of weight took place which increased at temperatures above 25° C. An increase in anodic treatment loss was accompanied by a decrease in subsequent corrosion loss. Microscopical examination of cross section revealed a uniform structure throughout. Explanation of increase in corrosion resistance is believed to lie in formation of an oxide film over entire surface which has been, to some extent, equipotentialized so that local action is minimized. Ha (4)

The Rapid Development of Patina on Copper. JOHN R. FREEMAN, JR. & P. H. KIRBY. *Metals & Alloys,* Vol. 3, Sept. 1932, pages 190-194. Desire of architects for rapid method of producing green coloration of weathered copper for its decorative effects led the Copper & Brass Research Association to study the matter. Authors report analyses obtained on several samples of patina which show it to be largely a basic sulphate of Cu. Exposure to synthetic atmospheres to accelerate formation of patina resulted in poorly adherent coating and required too great a period of exposure for commercial purposes. Electrolytic methods by first producing a black oxide coating later converted to green by reaction with $CuSO_4$ solution was either poorly adherent or too thin to give desired color effect. Alternate immersion in ammonium sulphate solution and exposure to air or oxiding conditions gave satisfactory patina in reasonable time. This coating had a slightly darker color due to presence of ammonium complex which could be bleached out by treatment in hot water. Composition of solution and its proper acidity, 5.5 to 5.7 pH is discussed. 7 references. WLC (4)

When this "Old Timer" came in . . .

We checked up its history

The old style valve pictured here was sent in for repairs by the Riverside Acid Works, Warren, Pa., manufacturers of Sulphuric, Muriatic, Nitric, Hydrofluoric, and Battery Acids, Electrolyte and Salt Cake. As it was so old, we wrote them to tell us more about it.

Mr. Geo. J. Hesch, General Manager, wrote us, in part, as follows:

"These cocks were originally purchased in September and December, 1912, and were in constant use by us from that time until December 1914. During that entire time, the cocks were used on 66° reclaimed Sulphuric Acid continuously. We are unable to state as to how long after that they were continued in service.

". . . these cocks were the initial Duriron Products put into use at this plant and we have been using your Duriron cocks of various types up to and including the present time."

We examined the valve carefully and could find no evidence of corrosion on the Duriron parts, though the malleable iron flange was partly destroyed. When the valve was tested for pressure tightness, the test showed almost as high as when the valve was first made—21 years ago.

There's no question about it, Duriron can stand the punishment—and it will pay you to use it, as it has others, if you have corrosive chemicals to handle.

The DURIRON COMPANY, Inc

432 N. FINDLAY STREET DAYTON, OHIO

Manufacturers of Corrosion-Resisting

DURIRON DURCO ALLOYS DURIMET

ALCUMITE DURICHLOR

STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Ternary System Silver-Copper-Oxygen. (Das Dreistoffsystem Silber-Kupfer-Sauerstoff.) K. W. FROEHLICH. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle,* Vol. 5, Jan./Feb. 1932, pages 100-103. Deleterious influence of cuprous oxide on Ag-Cu alloys was investigated. If pure Ag and Cu_2O are mixed a eutectic mixture is obtained of 97.7% Ag and 2.3% Cu_2O at 941° C. When this mixture freezes Cu_2O is segregated in such fine distribution that it can be detected only with very high magnification. Melting point of alloys of Cu_2O with 5-80% Ag is almost constant at 1134° C. Solidified pieces show heavy segregation and consist of 2 parts: the upper one, silver-gray, with physical properties of Cu_2O, and the lower rich in Ag and with entirely metallic character. Liquid Ag and liquid Cu_2O mix only to a limited extent, at 1200° C. Molten Ag takes about 12% Cu_2O while molten Cu_2O can take about 10% Ag. An equilibrium diagram is given of Ag-Cu alloys with and without Cu_2O addition which shows appreciable differences in the melting point. An alloy of 66.5% Ag, 32.8% Cu and 0.7% Cu_2O has the lowest possible melting point in this ternary system, i.e. 776° C., and has a purely eutectic structure. Ag and AgCu alloys become considerably harder by addition of even a few tenths of a percent of Cu_2O. Ha (5a)

Transformations in Homogeneous Materials. (Unwandlungen in homogenen Stoffen.) G. TAMMANN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Nov. 1932, pages 204-212. 3 different kinds of transformations have lately been investigated, (1) in the softening interval of glasses their properties change differently from the manner above or below this range; (2) an analogous behavior is observed in some crystalline materials; both these transformations are reversible while the (3) transformation of a material hardened by cold working into the soft conditions is non-reversible. The reversible transformations in crystals which take place without recrystallization are discussed and explained on the basis of tests for the α-β transformation of Fe and Ni and some binary systems of Fe C, β-brass and Cu-Au solid solutions. The respective equilibrium diagrams are developed. Ha (5a)

Conductivity of Aluminum Solid Solutions. (Über die Leitfähigkeit von Aluminiummischkristallen.) W. FRAENKEL. *Metallwirtschaft,* Vol. 12, Mar. 24, 1933, pages 159-161. Electrical conductivity of Al alloyed with up to 2 atomic % of In, Ga, Zn, Mg, Cu, Ge, Li, Ag and Mn was determined, using Al of 99.97% purity. Alloys were cast into 5 mm. dia. rods and drawn into 1.55 mm. dia. wire. They were heat treated by quenching from 450° to 600° C. Resistance of all alloys except Al-Mn alloys increases in direct proportion to atomic % of alloying element. With Mn curve flattens slightly with higher Mn content. Results show that theory of Norbury that increase in electrical resistance produced equal atomic additions is proportional to horizontal distance in periodic system of alloying element from base element does not hold true for Al alloys. Some results of electrical conductivity measurements on Al-Fe, Al-Ca and Al-Cd alloys are also given. 4 references. CEM (5a)

Ternary System Silver-Copper-Nickel. (Studien am Dreistoffsystem Silber-Kupfer-Nickel.) W. GUERTLER & A. BERGMANN. *Zeitschrift für Metallkunde,* Vol. 25, Mar. 1933, pages 53-57. Ternary system Ag-Cu-Ni was studied by thermal analysis and examination of micrographic structure. The miscibility gap in the liquid state in the system Ag-Ni extends from 4 to 98.5% Ag; this gap is closed by an addition of 42% Cu. The constitution of the ternary system is shown by isothermal sections and by a 3-dimensional diagram. The work shows that Ni is not a proper alloying element for Ag in the presence of Cu. RFM (5a)

Purity is Not the Usual Cause of Abnormality. Correspondence from MARCUS A. GROSSMANN. *Metal Progress,* Vol. 22, Aug. 1932, page 46. Comments on article of Duftschmid and Houdremont in May issue of Metal Progress on abnormality and comments that O and CO have decided effects on the speed of diffusion and abnormal structure. WLC (5a)

Dry Polishing Will Retain Graphite and Inclusions. S. F. URBAN & RICHARD SCHNEIDEWIND. *Metal Progress,* Vol. 22, Aug. 1932, pages 39-40. **Polishing Cast Iron for Metallographic Examination.** *American Gas Journal,* Vol. 138, Feb. 1933, page 16. Recommends following procedure for polishing specimens of gray or malleable Fe for metallographic examination: 1. Light grinding on fine emery or other abrasive wheel. 2. Grinding at right angles to previous grinding operation with No. 1 French paper, followed successively with 0, 00, 000 and 0000. 3. Removal of the last scratch on a used 0000 paper glazed by rubbing with a stick of graphite. 4. Polishing on a disc covered with billiard cloth moistened and charged with jewelers rouge. Water is used only as a lubricant. An alternate method for 2 and 3 uses a mixture of alumina and pumice in stearic acid on a sheepskin covered disc running at 1750 r.p.m. It is claimed that this method will avoid tearing out particles of graphite or inclusions. CBJ + WLC (5a)

Pearlite Field in Cast Iron Diagram of Maurer at Wall Thicknesses of 3 to 90 mm. (Das Perlitfeld in Maurerschen Gusseisendiagram bei Wandstärken von 3 bis 90 mm.) H. UHLITZSCH. *Die Giesserei,* Vol. 19, Nov. 25, 1932, pages 478-479. The diagram of Maurer which determines the ratio of C and Si is strictly valid only for a wall thickness of 30 mm.; it was investigated how far this holds for other dimensions. The curves of melts with different thicknesses were developed and by combination of all a field of pearlitic structure was found which was applicable for dimensions from 3 to 90 mm. Ha (5a)

Comparison of Intermetallic Compound $AuCd_3$ Obtained from a Melt and from a Solution. (Vergleich der aus Schmelze und Losung gewonnenen intermetallischen Verbindung $AuCd_3$.) P. A. THIESSEN & J. HEUMANN. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 209, Dec. 1932, pages 325-327. Deposit formed when metallic Cd is immersed in a very dilute solution of gold chloride was found to be absolutely same with regard to composition and structure as compound Au Cd_3 obtained from a melt. Ha (5a)

Form and Structure of Lead Shot. (Über die Form und Struktur des Bleischrots.) G. TAMMANN & K. L. DREYER. *Zeitschrift für Metallkunde,* Vol. 25, Mar. 1933, page 64. Effect of As in permitting the formation of true spheres in lead shot is not one of increasing the surface tension but fluxing (As_2O_3) the lead oxide formed. This flux surrounds the falling liquid particle and forms it into a sphere. Lead shot of various kinds (Pb, Pb with As, and Pb with As and Sb) are composed of a number of dendrites; the structures differ little. RFM (5a)

Single Crystals of the Intermediate Compound Antimony-Tin. H. S. VAN KLOOSTER & M. O. DEBACHER. *Metals & Alloys,* Vol. 4, Feb. 1933, pages 23, 24. 7 references. Single crystals of intermediate compound Sb-Sn were prepared in a 2 compartment vertical furnace with separate heating coils. A pyrex tube with capillary tip holds the metal. Temperature in the lower compartment is lower so that the crystal grows slowly at the capillary tip. Crystals are illustrated for cooling periods from ½ to 15 hrs. A single crystal 5 mm. long was obtained after 15 hours cooling. X-ray spectogram of the powdered crystals was made using a quadrant cassette. The pattern obtained showed that the compound Sb-Sn has a simple cubic structure. The value for the atomic distance in a unit cell with 4 Sb atoms and 4 Sn atoms at the corners is 3.061 A.U. Density on this basis ($N = 6.06 \times 10^{23}$) is 6.918. The value found by experiment was 6.9104 + 0.005 at 20° C. WLC (5a)

The Structure of Nickel-Zinc Alloys II. (Der Gefügebau der Nickel-Zink-Legierungen II.) W. HEIKE, J. SCHRAMM & O. VAUPEL. *Metallwirtschaft,* Vol. 12, Mar. 3, 1933, pages 115-120. This part covers investigation of alloys containing from 0 to 44% Ni by thermal analysis and microscopic examination. Constitutional diagrams and complete results of the thermal analysis are given. The structure of the alloys is shown in 14 photomicrographs and the various constituents are described in detail. 5 references. CEM (5a)

Magnesium-Zinc Alloys Constitutional Diagram. (Ueber das Zustandsdiagram der Magnesium-Zinklegierung.) A. A. BOTSCHWAR & I. P. WELITSCHKO. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 210, Jan. 1933, pages 164-165. Certain uncertainties in previous determinations of Mg-Zn equilibrium diagram were investigated and a new diagram was developed by using an etching agent (metanitrobenzoic acid) which permits more clearly distinguishing the grains of the structure; the individual grains of alloys with 33-42% Mg are colored differently if the duration of etching is short and the etching agent weak. The equilibrium in Mg-Zn alloys establishes itself only with difficulty. Ha (5a)

The Question of an Allotropy of White Tin and the Equilibrium Diagram of the System Tin-Cadmium. YOSIHARU MATUYAMA. *Bulletin Institute Physical & Chemical Research Tohoku Imperial University,* Vol. 10, Aug. 1932, pages 639-660; *Scientific Papers Institute of Physical & Chemical Research,* Vol. 16, Nos. 312-315, 1931. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 344. Ha (5a)

Plane Polarized Light in the Microscopic Investigation of Ores and Metals. FRELEIGH FITZ OSBORNE. *Transactions Canadian Institute of Mining & Metallurgy,* 1932, page 1-13. See *Metals & Alloys,* Vol. 3, May 1932, page MA 121. AHE (5a)

Precipitation of Alpha from Beta Brass. OSCAR T. MARZKE. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 29, Feb. 1933, 10 pages. The segregate of α precipitated from β brass may be either in the form of needles or plates. Needles are generally found when precipitation takes place at high temperatures and plates when at low temperatures. The orientation of the α with reference to the parent β lattice was estimated from strain lines. The α and β phases are related so that a {111} plate and [011] direction of the precipitate are parallel to a {011} plate and [111] direction of the matrix. Previous work on the Cu-Zn and analogous systems is reviewed. 6 references. JLG (5a)

Contribution to Problem of Steel Hardening. (Ein Beitrag zum Problem der Stahlhärtung.) HERBERT MÜLLER. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie,* Folge 7, 1932, 66 pages. Samples of high-C steels were quenched from 1010° C., and tempered at room temperature, 100°, 200° and 300° C. Samples were quenched in various media in order to obtain several structures. Tempering times were as long as 3000 hr. Changes during hardening were interpreted from Rockwell hardness values and microscopic examination. The 4 different types of steel used were: (1) 1% C, (2) 1.3% C and 0.66% Cr, (3) 1.0% C and 1.5% Cr, and (4) 1.35% C, 0.93% Cr and 5% W. In some drastically quenched samples hardness increased on aging at ordinary temperature. On tempering at 100° C. hardness increased slowly to a maximum and then decreased. Darkening of martensite needles occurred only after maximum hardness had been passed. Increase in hardness occurring at low temperatures was attributed to precipitation of finely divided carbides. C in solution in martensite precipitates as a carbide even at room temperature. Size of carbide particles depends chiefly on tempering temperature and amount of carbide formed on tempering time. Austenite decomposes at temperatures as low as 100° C. It is suggested that term martensite be restricted to tetragonal Fe lattice containing C in solution. On cooling, austenite can transform directly into pearlite. 82 references. JLG (5a)

Structure of Hyper- and Hypo-Eutectic Alloys. (Ueber die Struktur der über- und untereutektischen Legierungen.) A. A. BOTSCHWAR & K. W. GOREW. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 210, Jan. 1933, pages 166-167. Occurrence of "halos" or "envelopes" around crystals in eutectic solidifications of alloys was investigated in alloys of Sb, Pb, Bi, Cd and Sn. For each pair of these alloys one hypereutectic and one hypoeutectic alloy was examined and it could be stated that all systems can have these "halos," but only either in the hyper or in the hypoeutectic alloys, never in both. They form particularly easily in the sharply defined crystals of Sb and Bi. Ha (5a)

Composition of Carbide in High Speed Steel. Correspondence from J. W. WEITZENKORN. *Metal Progress,* Vol. 22, Nov. 1932, pages 43-44. Etch tests for carbides in 1/1 HCl and 10% HNO_3 are equally selective. Analyses show separation of carbides from metal in solution. WLC (5a)

Calorimetric Investigations of Tempering Phenomena in Hardened Carbon Steels. (Kalorimetrische Untersuchungen der Anlassvorgänge in gehärteten Kohlenstoffstählen.) FRANZ WEVER & G. NAESER. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 15, No. 4, 1933, pages 37-47. A special high-temperature calorimeter was developed to study the phenomena during tempering and drawing of hardened steels up to 400° C. The results are briefly: the velocity of the disintegration of martensite increases rapidly with temperature starting from 100° C. and at 140° C. is very great. The velocities of austenite disintegration and of cementite formation increase with temperature beginning at 200° C. For the isotherms of martensite disintegration mathematical expressions are derived. The decomposition of martensite and residual austenite takes place, contrary to transformations in metallic systems, not according to nuclei numbers and linear transformation velocity, but follows the simple law that the quantities transformed in unit time of martensite and residual austenite are proportionate. The tempering heat quantities as a function of C content show at 175° C. a slightly curved line, the approximately eutectoid composition of 0.97% C has 1.52 cal./g. tempering heat. At 350° C. this function is a straight line; here the tempering heat is 7.5 cal./g. for 0.97% C. An exact calculation is difficult as the individual transformation and decomposition heats are not sufficiently known. The majority of the transformation heat of austenite-pearlite is liberated during quenching to martensite structure, and the C separated during martensite decomposition is bound to cementite only at elevated temperatures; C reacts at 200°-240° C. with α-iron and forms Fe_3C. A mathematical treatment of the phenomena is given. 31 references. Ha (5a)

Experiments on the Effects of Variations in Mould and Pouring Temperatures on the Macro- and Microstructures of Some Low Melting-Point Metals and Alloys. FRANCES D. WEAVER (Mrs. Harold Heywood). *Institute of Metals, Advance Copy* No. 634, Mar. 1933, 14 pages; abstract, *Engineering,* Vol. 135, Mar. 17, 1933, pages 311-312; *Engineer,* Vol. 155, Mar. 17, 1933, pages 266-267. Small castings of pure Sn, commercial Sn, Sn plus 2% Sb, Sn-Pb eutectic, Pb-Sn-Zn eutectic, and an alloy containing 14.5% Sb, 7.7% Sn and 77.8% Pb were cast and examined. Several pouring temperatures and several mold temperatures were used for each alloy. Primary crystal structure of all alloys was increased by raising either pouring temperature or mold temperature. Cored structures within grain, generally described as microstructure, were either coarsened or refined by raising pouring temperature, according to mold temperature. With low mold temperatures cored structure became finer as pouring temperature increased. Very large crystals were formed in castings of pure Sn, and much smaller ones in commercial Sn cast under same conditions. 5 references. LFM + JLG (5a)

Transformations in the Binary Iron-Manganese Alloys. F. M. WALTERS, JR. *Mining & Metallurgical Investigations Carnegie Institute of Technology, Mining & Metallurgical Advisory Boards,* 6th Open Meeting, Oct. 28, 1932, 2 pages. Mn lowers temperature of transformation from γ-Fe. The reverse transformation is influenced to a much greater degree. In binary alloys containing 16 to 30% Mn the γ-phase is transformed into the ϵ-phase which has a hexagonal close-packed arrangement and a higher density than γ. Alloys with 10 to 13% Mn form both α and ϵ from γ. The various allotropic transformations can be best studied by dilatometric measurements in conjunction with X-ray measurements. This was done and the exact transformation points and the amount of α, γ and ϵ-Fe determined. Also the influence of cold work upon the transformations was studied. Ha (5a)

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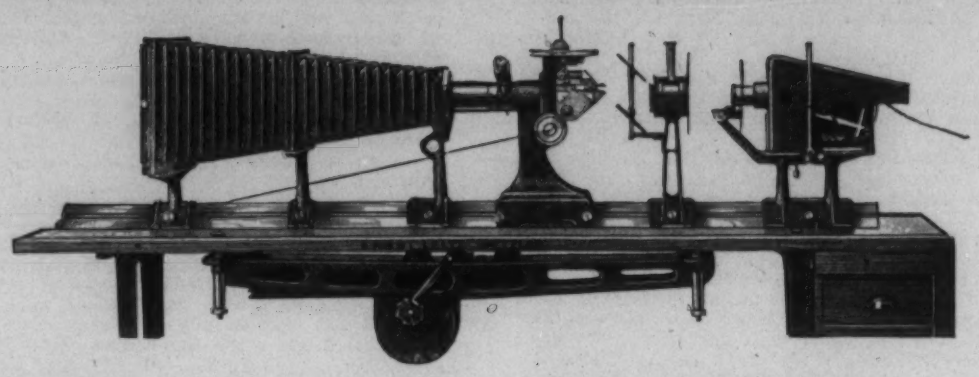

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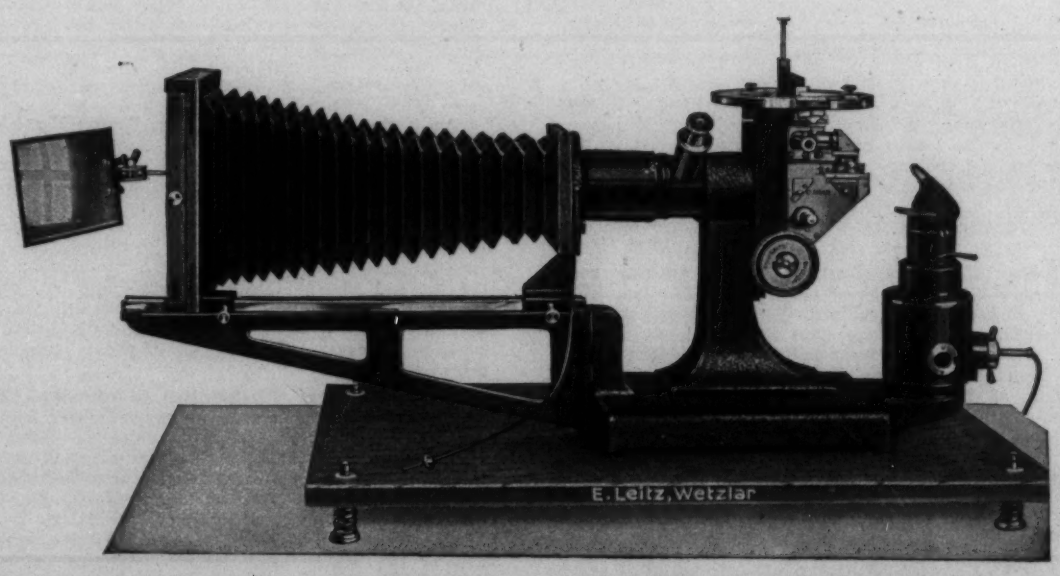

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Structure & X-Ray Analysis (5b)

Radium in Engineering Practice. V. E. Pullin. *Engineering*, Vol. 135, Mar. 24, 1933, pages 335-336, 340-342. Includes discussion. Condensed from paper read before Institution of Mechanical Engineers, Mar. 17, 1933. LFM (5b)

A Portable X-Ray Laboratory. V. E. Pullin. *Engineer*, Vol. 154, Dec. 9, 1932, page 594. Illustrated article describing portable equipment designed and constructed in the Research Department at Woolwich. The apparatus is capable of examining engineering structures up to a thickness of 4″ of steel. LFM (5b)

X-rays and Elastic Deformation in Metals. (Raggi X e deformazioni elastiche nei metalli.) *Giornale di Chimica Industriale ed Applicata*, Vol. 15, Jan. 1933, pages 8-13. Outline of methods used, especially that of Debye. AWC (5b)

Secondary Emission of Electrons from Molybdenum. Paul L. Copeland. *Journal Franklin Institute*, Vol. 215, May 1933, pages 593-598. Ratio of number of secondary electrons to primary electrons of various energies incident on a Mo plate, previously subjected to severe heat treatment, was measured. The results obtained resemble those reported by Petry more closely than they do the more recent work of Hyatt and Smith. Possibilities for explaining discrepancies are suggested. Mo has been used extensively in the study of phenomena influenced by surface conditions since severe heat treatment of the metal is possible. DTR (5b)

A Geometrical Method of Determining the Crystal Axes of Single Crystal Wires. Bruce Chalmers. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 14, Oct. 1932, pages 612-616. Study was conducted with Cd. Determination may be made by X-ray method, but method described is shorter. Wire is stretched. Measurement is made with a microscope. Full details of method are given. Method is accurate within 1°. RHP (5b)

A Displacement in the N Lines of Tungsten and Tantalum. F. C. Chalklin. *Nature*, Vol. 129, June 18, 1932, pages 905-906. Using a water-cooled anti-cathode, on to which W was sputtered from the hot filament of the X-ray tube, lines were obtained at 55.58 and 58.42 A.U. Using an anti-cathode of W sheet, allowed to become incandescent, the lines were displaced, being found now at 55.29 and 58.09 A.U. respectively. This represents an increase in the corresponding energies of 1.2 electron volts for each line. For Ta the difference between hot and cold anti-cathodes is 3.2 volts. Different explanations of the phenomenon are discussed. Kz (5b)

X-Ray Study of the Copper End of the Copper-Silver System. Roy W. Drier. *Industrial & Engineering Chemistry*, Vol. 23, Apr. 1931, pages 404-405. Results show that, in samples examined, Ag was not dissolved in Cu. It is thought that there is no solid solution formed by Ag atoms replacing Cu atoms in Cu lattice—that is, under ordinary room conditions Ag is not soluble in Cu. MEH (5b)

Testing Welds and Other Objects by Gamma Ray Radiography. Gilbert E. Doan. *Paper presented before the International Acetylene Association*, Philadelphia, Nov. 1932, 6 pages. Besides penetrating thicker objects the use of gamma rays has advantage that no cumbersome machinery but only a small capsule containing a radium salt is needed; the absence of danger of extremely high voltage is an especial advantage in its use. Manner of calculating times of exposure from gamma rays applied is explained and the technique of taking photographs described. Examples are illustrated. Ha (5b)

Inspection of Welds with Gamma Rays. Gilbert E. Doan. *Transactions American Society for Steel Treating*, Vol. 19, June 1932, pages 752-767. Previously abstracted as Preprint No. 34, 1931. See *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 8. Includes discussion. WLC (5b)

Transformation in Single Crystals of Cobalt. (Über die Umwandlung von Kobalteinkristallen.) U. Dehlinger, E. Osswald & H. Bumm. *Zeitschrift für Metallkunde*, Vol. 25, Mar. 1933, pages 62-63. The proposal by Dehlinger that a single crystal suffering an allotropic transformation does so by a simple shearing movement of atoms upon that atom plane of the proper family of planes which will produce the smallest increase in surface area of the crystal (*Metallwirtschaft*, Vol. 11, 1932, page 223) is here studied for the allotropic transformation in Co. Three large Co crystals of the low-temperature hexagonal phase were found so oriented with respect to the longitudinal axes of the crystals as to support Dehlinger's proposal. Heating and cooling these crystals through the transformation temperature did not alter the orientation of the hexagonal phase. One of these crystals cut so as to produce a major axis perpendicular to the original longitudinal axis produced a transformation on a second of the 4 possible octahedral planes as predicted. RFM (5b)

New Contributions to the Theory of Recrystallization. (Neue Ansätze zur Rekristallisationstheorie.) U. Dehlinger. *Metallwirtschaft*, Vol. 12, Jan. 27, 1933, pages 48-50. It is proposed that stresses exist in recrystallized grains, that is, that there are parts possessing greater energy than the completely homogeneous lattice. In these cases the atoms have been moved from their regular position in the lattice. It has been proved lattice disturbances in recrystallized grains are greater than in cast grains of the same size. Contrary to former theories the nuclei of the new grains form at the locations in the lattice which were deformed the least amount. The transformation consists of a gliding of the atoms instead of a complete change of location. Thus the new nuclei impress both their orientation and internal stress on the surrounding lattice parts. The single phase theory of recrystallization, according to which whole aggregates of atoms change their position only slightly, is to be preferred to the double phase theory. While the nuclei are present before recrystallization a period of nucleus formation does exist consisting of a process of diffusion. During this period the locations of highest energy break up so that the formation of new grains can begin at the locations of least energy. When the amount of deformation is increased a larger number of points of least energy forms which correspond to nuclei for new grains. This accounts for the relation between rate of deformation and grain size. 10 references. CEM (5b)

Polish on Metals. R. C. French. *Nature*, Vol. 129, Jan. 30, 1932, pages 169-170. Method of electron diffraction has been used to investigate nature of surface layer of polished metals. Polishing of Cu or Ag with emery with light magnesium oxide and water and of stainless steel polished with rouge and water showed that a change in atomic spacing was produced. It is considered that atoms of metal in polished surface have a semi-orderly arrangement and that Beilby's view of formation of vitreous layer is substantiated. Ha (5b)

Polish on Metals. J. T. Randall & H. P. Rooksby. *Nature*, Vol. 129, Feb. 20, 1932, pages 280-281. Electron diffraction investigation of polished metal surfaces tends to show that with increasing degree of polishing, crystal breaks down into smaller units, interplanar spacings eventually being altered. At the same time, a certain amount of truly amorphous material may be produced. This tends to fog diffraction pattern, so that weaker bands become indistinct or invisible. Ha (5b)

Plastic Elongation of α-Iron Crystals. (Ueber die plastische Dehnung von α-Eisenkristallen.) W. Fahrenhorst & E. Schmid. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft 21, 1933, pages 52-57. The mechanism of deformation of α-crystals was investigated by tensile tests at room temperature and at 185° C. The crystallographic translation is determined as T = 123 and t = [111] at room temperature while at lower temperature hardly any translation can be observed. Tests are illustrated by diagrams and X-ray patterns. 10 references. Ha (5b)

X-Ray Analysis of Iron-Tin Alloys. W. F. Ehret & A. F. Westgren. *Journal American Chemical Society*, Vol. 55, Apr. 1933, pages 1339-1351. A number of alloys in system Fe-Sn were examined and following phases were found: α phase, a solid solution of Sn in α Fe; β phase; β′ phase, which is shown by alloys containing 27, 39, 48 and 59% Sn after annealing at 680°; β″ phase exhibited by alloys containing 27, 39 or 48% Sn and annealed at 860°; γ phase, found in alloys quenched from 750-900°, and containing 27, 39 and 81% Sn; $FeSn_2$ phase and the Sn phase. MEH (5b)

X-Ray Diffraction Patterns Show Strain in Metals. N. P. Goss. *Metal Progress*, Vol. 22, Nov. 1932, pages 48-51. Crystal studies by the X-ray of various workers are discussed. A method of commercial application of X-ray study is suggested. Crystal distortion can be used as a qualitative measure of perfection in structure. Perfect and distorted crystals, singly and in aggregate, are illustrated. WLC (5b)

The Equipment of an Industrial X-ray Laboratory. Charles O. Herb. *Machinery*, Vol. 38, Feb. 1932, pages 408-411. Description of X-ray laboratory facilities of Robert W. Hunt Co., Chicago, Ill. Radiographs are made with a 200,000 volt Coolidge tube. An 88,000 volt tube is used for studying grain size and metal strains. Practically all work is done in a lead lined room. Some large castings are X-rayed while on a railroad siding which is adjacent to the laboratory. Describes dark room and discusses briefly some of work done. RHP (5b)

X-Rays' Place in the Non-Ferrous Metal Industry. Herbert R. Isenburger. *Metal Industry*, N. Y., Vol. 31, Apr. 1933, pages 121-122. Non-ferrous metal objects may be examined radiographically with photographic film or photographic paper or on fluorescent screen. The film is the most sensitive, most rapid, and most expensive and may show fine cracks not visible on paper or fluorescent screen. But sharper outlines around edges are obtained on paper and small defects within the material toward the edges may not show upon the film on account of fogging but will be detected on paper. The appearance of defects can be raised up to 1% precision with film or paper in thicknesses up to an inch of material, and to 2% if above 1″. Defects of about 4% of the total thickness of material can be detected on a fluorescent screen. X-ray photos can be used as aids in selling articles that have been defective in past. The foundryman may use X-ray examination in perfecting casting technique especially when starting a new mold. PRK (5b)

Recent Developments in X-Ray and Gamma-Ray Inspection of Power-Plant Materials. Herbert R. Isenburger. *Steam-Plant Engineering*, Vol. 2, Jan. 1933, pages 7-9. X-ray and γ-ray inspection are compared. (1) The operator can be protected against the bad effects that continuous X-ray exposure will have on the human body while it is impossible with γ-rays. (2) Inspection with X-rays is more reasonable than with γ-rays. (3) The wave length of X-rays is controlled by the voltage, so that sufficient detail can be secured, while the wave-lengths of γ-rays are always the same (effective only above 4″ of steel). (4) Short exposures are used on sections of steel less than 4 inches thick, with X-rays, γ-rays require long exposure, preferably all night. (5) X-rays give good contrasts, γ-rays give reduced contrasts. (6) While special exposure technique is necessary for X-rays, few precautions are necessary with γ-rays. AHE (5b)

Application of Gamma Rays in Cast Steel. (Die Anwendung von Gammastrahlen beim Stahlguss.) H. R. Isenburger. *Die Giesserei*, Vol. 20, Feb. 3, 1933, pages 46-48. Gamma rays are applied where either material is too thick to be penetrated by X-rays or where local conditions make arrangement of rather large apparatus for X-rays impossible. Steel of more than 8 cm. thickness does not give good pictures with X-rays; gamma rays of shorter wave length, about 0.008 A.U. are applied. The methods of application are described, time charts for exposure for different thicknesses, precautions to protect operators against the radiation, and several photographs are given. Ha (5b)

Selective Transmission of γ-Radiation by Lead. F. L. Hopwood, T. E. Banks & T. A. Chalmers. *Nature*, Vol. 130, Oct. 1, 1932, page 506. Investigation consisted in continuous comparison of the γ-ray transmission through pairs of screens, Pb and Bi, Pb and Tl, Pb and Cu, etc., when using as the source of radiation the aging active deposit obtained in freshly filled radon containers. Comparisons carried out before the attainment of the transient equilibrium between radium B and C show that the transmission ratios Pb/Bi, Pb/Tl gradually increase to a maximum and then decrease. It appears that a substance is selectively transparent to some at least of the radiations by its radioactive isotope. Kz (5b)

An X-Ray Investigation of the Copper-Aluminium Alloys. A. J. Bradley & Phyllis Jones. *Institute of Metals, Advance Copy* No. 625, Mar. 1933, 27 pages. Alloys of Cu-Al system were examined by X-ray powder method and some by microscope. Special attention was paid to heat treatment. Body-centered β phase could not be retained on quenching. β′ phase resulting on quenching from β field closely resembled face-centered α structure. Alloys quenched from γ field were indistinguishable from δ alloys. An attempt was made to completely determine structure of δ phase. It is essentially of γ-brass type. δ′ (beyond 19% Al) is pseudo-cubic and unit cell contains from 52 to 49 atoms. ε phase appears to be cubic. η phase field as given by Stockdale was found to contain a number of phases, or a general modification of η phase appears as composition changes. Structure of θ phase proposed by Friauf was confirmed. 34 references. JLG (5b)

X-ray Study of Precipitation Hardening. (Röntgenographische Beiträge zum Vergütungsproblem.) Oskar Summa. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 1, 1932, 43 pages. X-ray apparatus used and methods of interpreting powder patterns are briefly described. Precipitation-hardening alloys are discussed. In order to aid in identifying lines in patterns of hardenable alloys powder patterns of Al, Zn, Cu, Cu_2Mg, Al_2Cu, NiAl, and a 60/40 Al/Zn alloy were obtained. Patterns are shown. German and American Al-rich casting alloys were studied. Former contained 10, 15 or 20% Zn with 2% of Cu, Mg or heavy metals. American alloys contained 8 or 16% Cu, and 2% of Mg or heavy metals. Zn-bearing alloys as quenched showed only Al lines; as aging continued Zn lines and then Cu_2Mg lines were observed. Hardness measurements indicated that Cu_2Mg was at least partly responsible for hardening. Parameter decreased from 4.038 A.U. in a quenched alloy to 4.027 A.U. in the aged alloy as the Brinell hardness increased from 53.4 to 118.5. Lines from $CuAl_2$ and Cu_2Mg were observed in the aged alloy. A study of Britannia metal indicated that precipitation of a Sn-Sb compound and not a Cu-Sn alloy was responsible for hardening, as alloys containing no Cu hardened. 28 references. JLG (5b)

The Structure of Electrodeposited Alloys. II. The Effect of Current Density and Temperature of Depositions on the Structure of Silver-Cadmium Deposits. Charles W. Stillwell & Henry I. Feinberg. *Journal American Chemical Society*, Vol. 55, May 1933, pages 1864-1870. An X-ray diffraction study of the structure of alloys deposited at current densities ranging from 0.1 to 1000 amp./dm.^{2} and at 27° and 90° has brought out the following results. 1. The metals are always deposited as solid solutions or compounds. Under no conditions is the deposit a mixture of Ag and Cd crystals. This holds true for both metallic and non-adherent deposits. 2. The phase stable in a given range of composition of the thermal alloy is usually the predominant phase in an electrodeposited alloy in that same composition range. Exceptions have been noted. 3. The deposits are heterogeneous, containing small amounts of phases which do not exist in annealed alloys of the same composition. 4. Preliminary results indicate that an alloy deposited at low current density is more homogeneous than one of the same composition deposited at high current density; and in a homogeneous alloy deposited at low current density the crystals are oriented with respect to the cathode. 5. There is some indication that the metastable beta-phase is deposited at high current densities and high temperatures. 6. Crystalline $Cd(OH)_2$ is present in all burnt deposits. MEH (5b)

Diffraction of X-rays by Liquid Metals. J. T. Randall & H. P. Rooksby. *Nature*, Vol. 130, Sept. 24, 1932, pages 473-474. When a beam of monochromatic X-rays is passed through a liquid, the intensity of scattered radiation does not, in general, fall off uniformly with scattering angle. One or more regions of maximum intensity are usually observed, which appear as bands or diffuse rings on a photographic plate. It is suggested that temporary groupings of considerable numbers of atoms or molecules in the liquid account for the diffraction effects. It appears that the units in the liquid are probably trying to group themselves according to their customary positions below the m.p. The approximate spacings of the bands observed in X-ray diffraction experiments on several liquid metals are presented in a table. Kz (5b)

Polish on Metals. F. Kirchner, C. A. Murison, N. Stuart & G. P. Thomson. *Nature*, Vol. 129, Apr. 9, 1932, page 545. Discussion on how much diffraction rings indicate size of crystals. They show exact degree of levelling of surface. Surfaces of Pt sputtered onto glass have been examined by electron diffraction method and are found to give different diffraction patterns, according to previous use. It is probable that diffuse rings are due to material in a very finely divided condition rather than to flatness of Pt surface. Ha (5b)

Radiography of Metallic Products and Interpretation of Intensity Measurements. (Röntgenschattenbilder von metallischen Werkstücken und ihre densographische Auswertung.) Maximilian Freiherr von Schwarz. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 8, 1932, 35 pages. Radiographs of castings and welds are shown and their interpretation discussed. Darkening of film along any line can be determined by means of Stumpf apparatus, which plots intensity against distance along the line. In this apparatus the film and a sheet of light-sensitive paper are moved so that the film passes under a narrow beam of light. The light passing through the film falls on a photoelectric cell connected with a galvanometer that reflects a 2nd beam of light on the light-sensitive paper. From the intensity curves it is possible to determine the thickness of the metal through which the X-rays passed. Radiographs of built-up sections and commercial products together with curves obtained by means of the Stumpf apparatus are given to prove that the thickness of any portion of metal subjected to test may be accurately determined. JLG (5b)

Crystal Structure of Tantalum Carbide. (Die Kristallstruktur von Tantalkarbid.) M. V. Schwarz & O. Summa. *Metallwirtschaft*, Vol. 12, May 26, 1933, page 298. Lattice constant of a pure grade of TaC powder containing very little O and N was determined by the Debye-Scherrer method as a = 4.4460 A.U. ± .0005. The structure is face centered cubic of the NaCl type. CEM (5b)

Practical Methods of Analysis for Fine-structure Investigations. (Praktische Auswertungshilfsmittel für Feinstrukturuntersuchungen.) Maximilian Freiherr von Schwarz & Oskar Summa. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 6, 1932, 42 pages. Gives directions for interpreting powder patterns. Describes construction of nomograph for analysis. Formulae for estimating line intensities are given. Table I gives $\sin^2$ values and their logs for 0.1°. Table II gives frequency values, Σh^2, and log Σh^2 for planes in cubic crystals up to $\Sigma h^2 = 101$. Table III gives wave lengths of K series for common anti-cathode materials. Table IV gives frequency values for special planes in the 32 crystal classes. Table V gives values of polarization factors, Lorenz Factors, and their product. Miscellaneous formulae are given. 13 references. JLG (5b)

In Which Binary Intermetallic Alloys are β, γ and ϵ Lattices to be Expected? (In welchen binären intermetallischen Legierungen sind β, γ und ϵ Gitter zu erwarten?) Harold Perlitz. *Metallwirtschaft*, Vol. 12, Feb. 24, 1933, pages 103-104. From the laws relating to valence electron concentrations for β, γ, and ϵ lattices it follows that they are to be expected as intermediate phases only in those binary intermetallic alloys in which one pure component contributes not more than one and the other pure component at least 2 valence electrons of metallic bond to the lattice structure. These components are on the one hand Cu, Ag, Au and the transition elements with electron deficiency and on the other Be, Mg and the metals of the B sub-periods. The number of valence electrons of metallic bond is 0 for the atoms of Mn, Co, Fe, Ni, Rh, Pd, and Pt which show electron deficiency. It is equal to the salt valence for Cu, Ag, Au, Be, Mg, Zn, Cd, Al, Si, Ge, Sn and Sb, but different from the salt valence for Hg and In. 9 references. CEM (5b)

An X-Ray Analysis of Iron Pyrites by the Method of Fourier Series. H. M. Parker & W. J. Whitehouse. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 14, Supp. No., Nov. 1932, pages 939-961. 5 references. Presents an analysis of iron pyrites, which verifies deductions of Bragg and West from their ideal crystal. Results give an accurate value of parameter which defines position of S atoms, and give some evidence that pyrites structure is based on homopolar binding. Structure involved only one unknown parameter. Includes several tables, diagrams and charts. Results consist of precise measurements of spacing of crystal and parameter of S atom. Diffraction rings surrounding each peak were found to have predicted radii. 26 electrons were found in Fe atom which definitely indicates that compound is not ionic. No direct evidence of electrons of homopolar bonds could be obtained with present sensitivity. RHP (5b)

X-ray Examination of Antimony-Lead and Tin-Lead Alloys. (Röntgenographische Untersuchungen an Antimon-Blei- und Zinn-Blei-Legierungen.) I. Obinata. *Metallwirtschaft*, Vol. 12, Feb. 24, 1933, pages 101-103. Alloys of Pb with Sb up to 2.98% and with Sn up to 25% were chill cast and drawn into 1 mm. dia. wire. After homogenizing for 2-7 days at 235° C. and 175° respectively they were examined by the X-ray diffraction method and their lattice constants were determined. For pure Pb a = 4.9389 A.U. was found. In both alloys the formation of the solid solution causes a shrinking of the lattice constants, approximately proportional to the atomic % of the alloying metal. Sn produces about 3 times as much shrinkage as Sb. For the Sn-Pb alloys the lattice constants at 150° C. were also determined. Calculating the coefficient of expansion from this data it is found that it does not vary much with difference in composition of the solid solution. Pb-Sb alloy samples were quenched from 250° C. and drawn at various temperatures and then examined. From the lattice constants of the heat treated samples the solubility of Sb in Pb at various temperatures was determined and the results checked well with results obtained metallographically. With Pb-Sn alloys good results could not be obtained because of changing solubility of the supersaturated samples at 20°. 7 references. CEM (5b)

Inter-Diffusion of Metals. E. A. Owen & L. Pickup. *Nature*, Vol. 130, Aug. 6, 1932, pages 201-202. The principal features of the high precision X-ray analysis are: (1) the direct measurement of a fundamental quantity, namely, lattice parameter, (2) each phase present at any time gives its own X-ray reflection lines independently from which its composition can be readily found from standard composition-parameter curves. This method was applied to the study of the inter-diffusion of mixtures of Cu and Zn particles heated in vacuo. The investigation shows that the inter-diffusion is entirely controlled by the thermal equilibrium diagram, the rate of diffusion in the various phases being different, and that the rate of diffusion at a given temperature is independent of particle size. Kz (5b)

Crystal Lattice Distortion in Stretched Wire. W. A. Wood. *Nature*, Vol. 129, May 21, 1932, pages 760-761. The process of cold-rolling or drawing produces a permanent irregular departure from the normal atomic structure of grains in certain metals (Cu, Ni) and most alloys. The criterion of true lattice distortion is a broadening of the lines in the X-ray spectrum formed by reflection of monochromatic X-rays. Proof is given that lattice distortion has taken place and not the formation of a very fine-grained structure, which also causes diffusion of X-ray spectra. Kz (5b)

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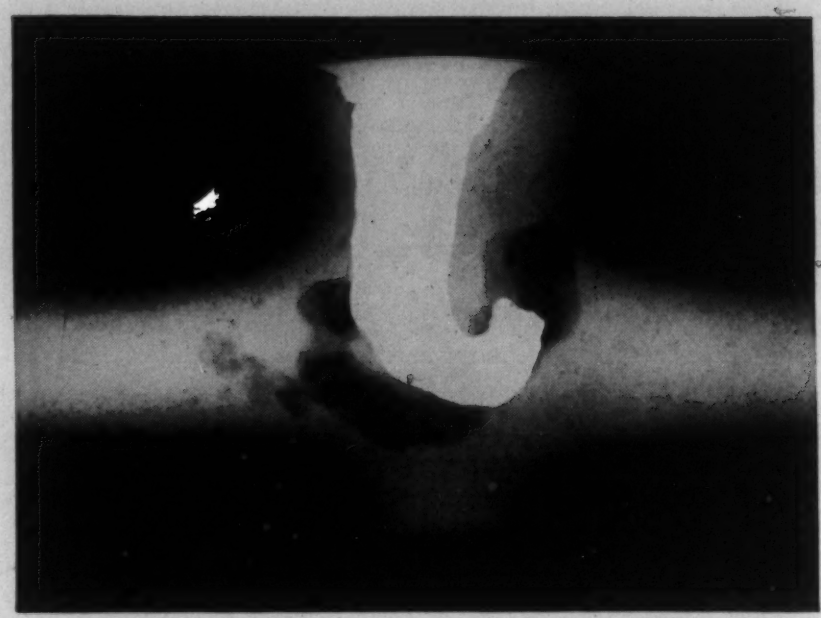

Radiograph of this casting revealed cavity in vicinity of gate, partially filled with metal after removal of gate.

THE manner in which the x-ray is utilized varies in different industries. Most boiler manufacturers radiograph all welded seams as routine procedure. An aluminum foundry reports that it is employed "both in determining the foundry technique which will give the most satisfactory casting and as a production check in order to maintain the original standards." Wire drawing and rolling mills use it to analyze, by means of diffraction patterns, the effects of various treatments on materials.

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PHYSICAL, MECHANICAL & MAGNETIC TESTING (6)

A New Method of Determining Elastic Moduli (Sur une nouvelle méthode de détermination des modules d'élasticité). PAUL LE ROLLAND & PIERRE SORIN. *Comptes Rendus,* Vol. 196, Feb. 20, 1933, pages 536-538; *Revue de Metallurgie,* Vol. 30, Mar. 1933, pages 112-116. Principle was discussed previously (*Comptes Rendus,* Vol. 192, 1931, page 336): vibrational energy is sent from an oscillating system through specimen to a second system which has a previous resonant with first system. Specimen may be in form of a long rectangular bar and oscillating systems may consist of 2 identical pendulums. The method has theoretical and practical advantages. Further applications are indicated in the paper. JDG + OWE (6)

Desultory Elongation of Zinc Crystals (Ueber sprunghafte Dehnung von Zinkkristallen). R. BECKER & E. OROWAN. *Zeitschrift für Physik,* Vol. 79, Dec. 15, 1932, pages 566-572. Under certain conditions which have been investigated more closely it was found that elongation-tension curve is not continuous but shows several sharp breaks depending greatly on temperature. These breaks occur after crystal has previously been bent. Tests are described in detail. Ha (6)

Simple Shop Tests for the Examination of Steels. (Einfache werkstattmässige Prüfmethoden zur Untersuchung von schmiedbarem Eisen.) A. BAUER. *Maschinenkonstrukteur-Betriebstechnik,* Vol. 66, Mar. 4, 1933, page 32. Outlines a few simple, so-called technological tests which permit small shops to test properties and quality of steel used. GN (6)

Specifications for Mild Steel Boiler Plate. (Vorschrift. Bleche aus Flussstahl.) *Zeitschrift für Schweisstechnik,* Vol. 23, Jan. 1933, pages 20-21. General specifications and test methods; including tensile tests at normal and high temperature, and bending tests. RRS (6)

Brinell Hardness. (De beteeknis der Brinell hardheid.) *Polytechnisch Weekblad,* Vol. 26, Jan. 21, 1932, page 42. Diagrams reveal relations between load and indentation on annealed Ni and cold rolled Cu, correlation of elongation to tensile strength of Ni in annealed and cold rolled state, and relationship between Brinell hardness and indentation of a 10 mm. ball on cold rolled and annealed Ni. A correlation of Brinell hardness to tensile strength holds for steel, but not for non-ferrous metals except in cold deformed state. WH (6)

Hardness Testing With a File a Successful Art Easily Learned. *Metal Progress,* Vol. 22, Dec. 1932, pages 15-18. Refers to an editorial Information Wanted About File Testing in Sept. *Metal Progress.* File tests to determine hardness are reliable in the hands of a skilled workman. Resistance to abrasion can be determined with a file within certain limits. Test blocks to check the files are a reliable means of determining the uniformity of the files. "File hard" depends on the pressure, speed, and angle between file and object. The term means that a metal cannot be cut by a file specially prepared for testing purposes. Scale, shape and density of the test piece and condition of the surface all affect the use of a file so good judgment must be depended on. WLC (6)

Mechanical Hardness Influenced by Magnetization. S. R. WILLIAMS. *Nature,* Vol. 129, June 25, 1932, pages 939-940. Discussion of the investigation of the effect of magnetization on the hardness of steel rods. It is shown and graphically illustrated that due to repeated magnetization and demagnetization the test rods were softened. Each time in magnetization the d.c. field was reversed. Apparently these tests caught only the softening stage which takes place by magnetic treatment because this decrease is followed by an increase and stability will be attained after 3 hours. Kz (6)

A Problem in Hardness Testing. *Machinery,* London, Vol. 40, May 12, 1932, page 171; discussion, June 23, 1932, page 373; June 30, 1932, page 401; July 21, 1932, page 500. Question is raised how to test surface of a roll 4 feet long by 4" diameter at intervals of ¼" for hardness. Suggested methods: (1) Placing the roll in a lathe and turning it while in contact with a tool that scratches soft spots. (2) Turning roll while in contact with a spherical-ended rod coupled to an indicator which records variation in hardness by variation in friction between rod and roll. (3) Brinell test is criticized and called insufficient for case-hardened steel and use of a Scleroscope is recommended. Any hardness test involving a device based on sliding friction is called unreliable. (4) Cloudburst work-hardening and testing machine is recommended. (5) It is suggested to make use of Scleroscope principle in which a ball falling from a fixed height rebounds in proportion to the hardness of the surface. A modified Scleroscope arrangement applicable to the revolving roll on the lathe is described. Kz (6)

Impulsive Torsion Tests. MITITOSI ITIHARA. *Journal Society of Mechanical Engineers,* Tokyo, Vol. 35, July 1932, pages 678-691. This paper, read before Meeting, Society of Mechanical Engineers at Sendai Jan. 23, 1932, reports results of torsion tests accomplished with a newly designed impulsive torsion tester. For determination of twisting moment, twist of a spring was utilized and M-θ curves of impulsive torsion were taken by photographs. Results of breaking cylindrical test pieces of annealed mild steel and copper by changing the speed, and M-θ curves at various shapes of notched test pieces of mild steel are statically compared. Based on Ludwick's theory and on twisting M-θ curves, problem of general variation of resistance to slip during deformation of materials in correlation to velocity has been studied. Kz (6)

Interpretation of the Tensile Test (with Reference to Lead Alloys). BERNARD P. HAIGH & BRINLEY JONES. *Institute of Metals, Advance Copy* No. 632, Mar. 1933, 12 pages. Modes of deformation of Pb alloys broken in tension vary widely, and values reported from usual tensile test do not serve to show true properties of material tested. A better measure of plastic properties is obtained if elongation is divided into general elongation and local elongation. For some purposes it is desirable to have a material with high general elongation, and for others a material with high local elongation. Relative amounts of 2 types of elongation can be determined by scribing a number of gage lengths on tensile specimen and measuring elongation over each. Photographs of broken specimens of extruded Pb alloys are included to show many types of deformation encountered. Stress-strain curves are analyzed. JLG (6)

Sintered Tungsten Carbide Brinell Balls. HAAKON STYRI. *Metals & Alloys,* Vol. 3, Dec. 1932, pages 273-274. Author describes tests conducted to compare Hultgren work hardened Brinell ball with tungsten carbide balls. Impression produced by tungsten carbide balls is easier to read on hard material and the ball undergoes very little deformation. Graphs show carboloy balls to give results more in accord with Vickers than Hultgren or Rockwell balls. Tungsten carbide balls may be used up to 1600° F. without appreciable softening. WLC (6)

Recent Developments in Hardness Testing. *Machinery,* London, Vol. 41, Feb. 2, 1933, page 520. Article refers to a meeting of the Sheffield Metallurgical Association where recent developments in hardness testing machines were discussed. Features of the different machines, and testing of very thin components, such as razor blades, and heat-resisting materials are taken up. The diamond scratch test was suggested to possess possibilities warranting its commercial development. Hardness tests had been carried out with a diamond at temperatures as high as 650° C. without adverse effects on the diamond provided that it is suitably mounted. Balls of Wimet metal have also been utilized in hardness testing at elevated temperatures. A suggestion is made that a desirable development would be a machine registering the depth of hardness. A method perfected by Herbert and Whitaker involves two different tests, one employing the pendulum hardness tester, giving the surface hardness, while the second indentation test is affected also by the thickness of the case. Kz (6)

Fatigue of Metals & Alloys (6f)

Cracking and Fracture in Rotary Bending Tests. F. BACON. *Engineer,* Vol. 154, Sept. 23, 1932, page 299; *Engineering,* Vol. 134, Sept. 23, 1932, pages 354-355, 372-376. Includes discussion. Paper read before Section G, British Association for the Advancement of Science, Sept. 7, 1932. Laboratory tests were made in an attempt to reproduce the features found on fractured faces of rolls, shafts and axles which failed in service by the gradual spreading of cracks. Describes 2 fatigue-testing machines developed to study the stages in the crack-spreading process, the modifications caused by the contact pressure of the loaded rollers, and the effect of periodically varying the limits of successive cycles of alternating stress. LFM (6f)

Vibration in Electrical Conductors. A. E. DAVISON, J. A. INGLES & V. M. MARTINOFF. *Electrical Engineering,* Vol. 51, Nov. 1932, pages 795-798. Mechanical vibrations set up in conductors of transmission lines seriously influence their properties especially fatigue strength. According to tests made in a laboratory using water as medium in which conductor vibrates, the vibrations can be diminished materially by use of different shapes of cable cross-sections; triangular cross-sections show least tendency to vibrate. 8 references. Ha (6f)

Combating Corrosion Fatigue by Pre-arranged Pressure Stress. (Die Bekämpfung der Korrosionsermüdung durch Druckvorspannung.) A. THUM & H. OCHS. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Sept. 17, 1932, pages 915-916. According to recent investigations into the corrosion problem the surface of a metallic piece cannot be assumed to be smooth but must be imagined as greatly wrinkled, "mountainous," so to speak, with hills and crevices. The actual surface has therefore 3 to 4 times the extent of that of its geometrical area. The crevices open and close in alternating stresses and in this manner offer a ready entrance into the interior to the corroding influences. It has been tried by producing compression stresses to prevent the opening of the crevices under load, and tests with such samples have indeed shown a beneficial influence. Ha (6f)

What is this thing called Fatigue?

These abstracts are prepared in cooperation with the A. S. T. M. Research Committee on Fatigue of Metals.

Importance of Fatigue of Metals to Engineering Design. T. A. SOLBERG & H. E. HAVEN. *Metals & Alloys,* Vol. 3, Sept. 1932, pages 196-199. Discuss importance of fatigue resistance in design of engineering structures in light of most recent discoveries in this field, with particular reference to effect of corrosion on fatigue of metals. Findings of investigations of 8 failures of various parts of Naval equipment under conditions of fatigue and/or corrosion are described. WLC (6f)

Some Comparative Corrosion-Fatigue Tests Employing Two Types of Stressing Action. H. J. GOUGH & D. G. SOPWITH. *Iron & Steel Institute, Advance Copy* No. 3, May 1933, 31 pages. The introductory part of article discusses the relationship between endurance limits obtained by the rotating-beam method and those obtained by reversed direct stress. An analysis of the propagation of a fatigue crack indicates that higher apparent values should be obtained with the rotating-beam test. Many data are given to show the relationship between values obtained by the 2 methods. The following materials were used in corrosion-fatigue tests: cold-drawn C steel containing 0.5% C, 3 non-corroding steels, duralumin, and a Mg alloy. These materials were tested in a salt spray by both rotating-beam and direct stress methods. A Haigh electro-magnetic machine was used for direct stresses. Stress reversal was at the rate of 2200 cycles/min. and tests were carried out as long as 100 million cycles. None of the materials gave any indication of a corrosion-fatigue limit for the conditions of test. The S-N curves when plotted on semilog. paper in the usual manner became straight lines after a certain number of cycles had been reached. The position of the curves varied from material to material. The Mg alloy was severely attacked by the salt spray, but the other materials were not badly corroded. The corrosion-fatigue curves obtained by the 2 methods did not fall one on top of the other, but they were relatively close together. 7 references. JLG (6f)

Fatigue Strength and Resistance to Slip. P. LUDWIK. *Metal Industry,* London, Vol. 41, Dec. 23, 1932, pages 613-615. This is an article on the relations between fatigue strength and static strength, translated from *Zeitschrift für Metallkunde,* Vol. 22, Nov. 1930, pages 374-376. See *Metals & Alloys,* Vol. 1, Mar. 1931, page 66. Ha (6f)

Fatigue of Metals, A Backward Glance. H. F. MOORE. *Metals & Alloys,* Vol. 3, Sept. 1932, pages 195, 207. Discusses "booms" and "depressions" in interest in fatigue of metals. Various cycles of interest in subject are given with outstanding results of work of each of the "booms." WLC (6f)

Plane-Bending-Endurance Testing Machine of German Aviation Testing Institute. (Planbiege-Dauerprüfmaschine der deutschen Versuchsanstalt für Luftfahrt.) K. MATTHAES. *Zeitschrift Verein deutscher Ingenieure,* Vol. 77, Jan. 7, 1933, pages 27-28. Machine measures endurance strength of materials for aeroplane construction in form of sheets and profiles. Sample rod is gripped in such manner that bending moment in alternate bending is almost same at all places of rod and therefore bending stress is almost constant over whole prismatic length of sample. Samples with widened heads break therefore at any place of test length. Magnitude and frequency of bending moment can be adjusted. Ha(6f)

Failure by Fatigue. J. B. KOMMERS. *Engineering,* Vol. 135, Mar. 3, 1933, pages 238-239. Comments on a discussion by J. Selwyn Caswell of a paper by Prof. Frederic Bacon entitled "Fatigue Stresses with Special Reference to the Breakage of Rolls" published in *Proceedings, South Wales Institute of Engineers* in 1931. Caswell believes that breakage of a roll takes place when principal tensile stress exceeds ultimate strength of roll iron, and therefore that hair cracks found in a large percentage of broken rolls are due to this cause. Bacon thinks hair cracks are themselves evidence that failure was caused by fatigue. Kommers believes that either of these views may be correct. He states that after surface cracks are formed they could act as nuclei for fatigue failure, effect of repeated stresses being such as to spread cracks until final failure occurred. He gives evidence to support his view. See also letter by J. Selwyn Caswell commenting on this article, *Engineering,* Vol. 135, Mar. 17, 1933, page 299. LFM (6f)

Fatigue Tests. Correspondence from H. J. GOUGH. *Metals & Alloys,* Vol. 4, Feb. 1933, page 22. Refers to editorial comment in *Metals & Alloys,* Dec. 1932, page 280, in regard to discrepancies between fatigue tests made on direct stress and bending machines and their relation to the results in air and vacuo. In direct stress tests, marked improvement occurs in vacuo for several materials. Bending stress tests are difficult to carry out but some improvement would probably occur. Editors note on same subject. 2 references. Results announced thus far in fatigue tests in vacuo are insufficient for the announcement of a definite law of fatigue in vacuo. See also abstract below. WLC (6f)

Fatigue Strength (Dauerfestigkeit). *Zeitschrift für Flugtechnik und Motorluftschiffahrt,* Vol. 24, Jan. 14, 1933, page 34. Experiments on annealed brass showed an endurance strength 26% greater in vacuo than in air. After the initial hysteresis had vanished the temperature did not pass 30° C. See also abstract above. Kz (6f)

ELECTRO-CHEMISTRY (7)

Protective Properties of Colloids and Their Behavior in the Electrolytic Deposition of Metals. P. A. JACQUET. *Nature*, Vol. 130, Nov. 26, 1932, pages 812-813. Investigations, which are discussed, show that the effect produced by the colloids on the electrolytic Cu deposit must be attributed mainly to phenomena similar to those manifested in protective actions, that is, they have to be brought back finally to adsorption. Kz (7)

Electrochemical Periodicities. E. S. HEDGES. *Nature*, Vol. 129, June 11, 1932, pages 870-871. When Cu was made the cathode in 10% HNO_3 at low current densities (about 5 milliamps./cm.^{2}) its potential oscillated continuously in periods having a duration of about 1 sec. and an amplitude of about 0.1 volt. No gas was evolved. The phenomenon is discussed and explained in connection with one reported by Butler and Armstrong. Kz (7)

Electroplating (7a)

Flexibility in the Metal Finishing Department. *Machinery*, London, Vol. 40, June 30, 1932, pages 402-403. Reasons for applying different finishing coatings to metal parts, metals to be plated and those used for plating, methods of plating and cleaning, as well as lacquering and enamelling of finished articles are discussed. Kz (7a)

Electro-deposition. *Engineer*, Vol. 155, Feb. 3, 1933, page 125. Summary of an article entitled "Mist Plating" which appeared in the Dec. 1932 issue of the *Industrial Bulletin* of Arthur D. Little, Inc., Cambridge, Mass. LFM (7a)

Control of Plating Solutions. *Metal Industry*, London, Vol. 41, Oct. 14, 1932, pages 377-379. In a discussion on this subject theoretical and practical points were treated. It was recommended to have a plating plant well equipped to solder all joints and to use as simple plating solutions as possible. Cleaning agents are discussed, tinning solutions are best made of Sn chloride in KOH with some KCN. General rules and bath compositions for Cu, Ag, Ni, Cr and brass plating are given. Ha (7a)

The Control of Electrodepositing Solutions. XII. The Silver Solution. SAMUEL FIELD. *Metal Industry*, London, Vol. 40, May 6, 1932, pages 499-500. The methods of estimating free cyanide, silver content, and carbonates in solution used for silver-plating are described, and removal of carbonates with barium cyanide and evaluation of this salt are discussed. WHB (7a)

Electrolysis Under the Microscope. (L'électrolyse sous microscope.) A. GLAZUNOV. *Chimie et Industrie*, Vol. 27, Special Number, Mar. 1932, pages 401-404. Presents material as a microscopic study of the cathodic deposition of metal as a function of the current density and the concentration of the electrolyte. The linear velocity of the cathodic crystallization during electrolysis is measured directly on a glass slide in the photographic chamber of an ordinary microscope. The number of centers of crystallization which formed during electrolysis were also measured directly with the microscope by reflection. The apparatus which is very simple was made by the author. The cathodic deposition of Ag formed during electrolysis with a variable current density is shown in a photomicrograph. The author thereby shows that electrodeposition is a process analogous to crystallization and that the nature of the deposit depends upon the linear rate of crystallization and on the number of centers of crystallization which formed in unit time. MAB (7a)

A Year's Progress in Electrodeposition. H. SUTTON. *Metal Industry*, London, Vol. 42, Jan. 13, 1933, pages 74-76, 82. General review; particular reference is taken to good cleaning methods, throwing power of a bath and deposition of Cd, Ni and Cr. A good throwing-power of a bath is defined as facility of depositing metal on those parts of the cathode which are at great distance from the anode as compared with other parts. Method of determining and obtaining throwing power are described. Ha (7a)

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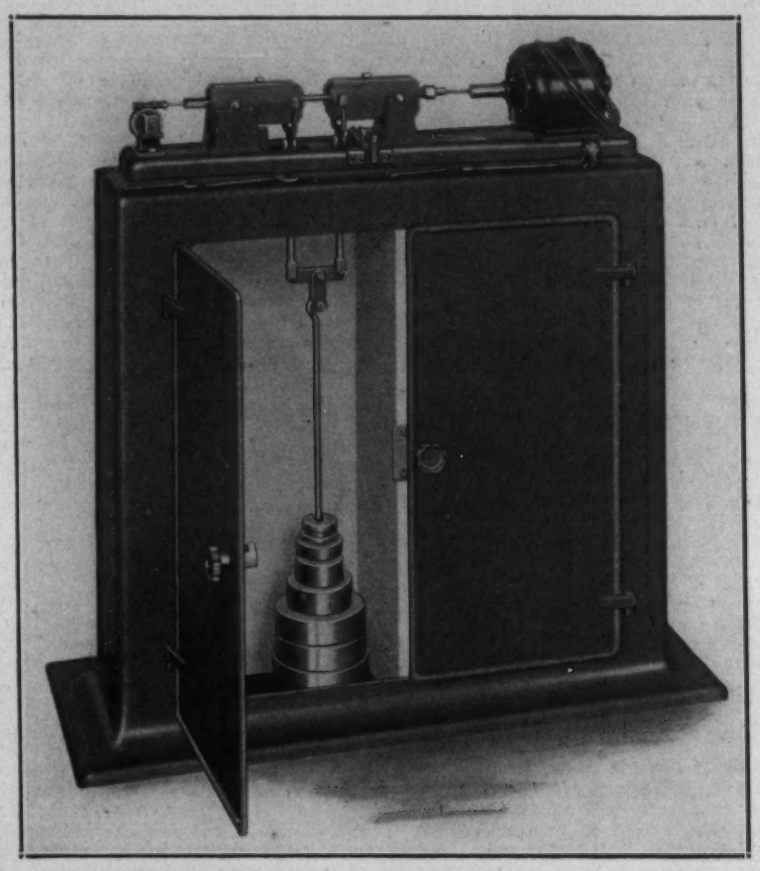

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METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Some Experiments on Tin Coating. I. Williams. 16 pages, 7¾"x5". Reprint of paper at Jan. 23, 1932 meeting of the Metallurgical Society of Swansea Technical College. Price 1s. A very condensed account of experiments in commercial tinning. These indicated that weights of coating, in lbs./box (31360 in.^{2}), vary considerably in different parts of a sheet, e.g., 1.56 to 2.07; that after a small degree of extension of a sheet by cold rolling, the weight of coating taken up becomes constant, falling up to that point; that the weight of coating tends to increase slightly the longer the time in the pickle; that desirable temperatures are 540° F. for the tin and 470° F. for the grease; that increase in roll pressure decreases the weight of tin coating; increase in speed of rolls increases the weight up to 250"/min. peripheral speed, with no effect thereafter; that strength of flux and height of grease have no marked effect; that re-tinning or "mending" does not change the weight of coating; and that the hardness or surface condition of the rolls has a definite bearing on the weight of coating. At around 220 Brinell roll hardness, the coating was about 1 lb. 14½ oz., at 134, 2 lb. 3 oz. HWG (8)

Hot Galvanizing of Iron and Steel. Allan B. Dove. *Canadian Chemistry & Metallurgy*, Vol. 17, Jan. 1933, pages 12-14. A general description discussing, in turn, pickling, fluxing, the coating operation, high and low C steels, relative alloy thickness, and dross and its formation. WHB (8)

Novel Material. (Neuer Werkstoff.) *Verkehrstechnik*, Vol. 49, Dec. 5, 1932, page 662. Cast Fe of 3.2-1.3 C besides Si and Mn has been rolled down to 1 mm. at 900°-1150° C. starting with 12 mm. cast Fe plates. A novel material has thus been secured exhibiting a ferritic or pearlitic matrix with stretched graphite-temper carbon streaks or ledeburite lines. This cast Fe sheet can be rolled onto steel insuring an intimate bond. The material is suitable for brakes, springs, piston rings, etc. WH (8)

Electrically Heated Galvanizing Furnace. R. M. Cherry. *Iron Age*, Vol. 129, Feb. 4, 1932, pages 334-338. Some of major items affecting cost of hot galvanizing are: (1) Temperature control; (2) Zn consumption and dross formation; (3) Labor; (4) Maintenance; (5) Production; and (6) Inspection. Desirability of electric heat is unquestioned except from standpoint of cost. Tabulates data on operation of pipe and wire galvanizing furnaces. Efficiency of galvanizing depends upon keeping temperature within a certain limited range. Describes typical installations. VSP (8)

Eloxated Light Metal. (Eloxiertes Leichtmetall.) *Aluminium*, Vol. 14, Sept. 30, 1932, pages 1-2. Nature of "eloxation" of Al or Al alloys, that is, the production of an artificial oxide coating on surface by electrolysis, is briefly explained. Hardness of coating can be varied in wide limits by composition of bath; radiation of eloxated surfaces closely approaches that of a black body. The eloxal layers can also be colored. Ha (8)

Tin Plating with the Oxy-acetylene Flame. (Verzinnen mit Hilfe der Azetylen-Sauerstoffflamme.) *Der Autogen Schweisser*, Vol. 5, Dec. 1932, page 251. Method of tin plating with oxy-acetylene flame on parts too large for ordinary plating plant equipment is described. Kz (8)

Electro-Metal Spraying. *Electrician*, Vol. 110, Jan. 20, 1933, page 70. In the Schoop process of electro-metal spraying 2 wire electrodes are brought into contact by means of a feeding mechanism and a short circuit is produced. The molten metal is blown away by compressed air, which breaks the circuit producing an arc, the heat of which is sufficient to melt more of the wire electrodes. Temperature of the melting zone reaches 4000° C. and Mo, Cr, W, and their alloys can be sprayed. CBJ (8)

Thermal Finishes on Steel. *Machinery*, London, Vol. 40, Aug. 11, 1932, pages 586-587. Discusses characteristics and methods of heating steel to produce oxide films as well as oil blackening. Kz (8)

Artificial Patina on Copper. W. H. J. Vernon. *Metal Industry*, London, Vol. 40, Apr. 29, 1932, page 479. In a letter commenting on claims of American Copper & Brass Research Association in connection with production of an artificial green patina on copper, Vernon observes that facts on which these claims are based were published in 1929. It was further shown that after very prolonged exposure, basic sulphate, which had been found to be principal constituent instead of basic carbonate, coincided in composition with mineral brochantite, $CuSO_4:3Cu(OH)_2$, which fact received no acknowledgment in American specification. A provisional patent was not completed, as it was found that more prolonged exposure caused deposit to flake, but a provisional patent has since been filed for an improved method. Results of work as a whole will be published in due course. WHB (8)

Notes on Modern Galvanizing Fluxes. A. J. T. Eyles. *Sheet Metal Industries*, Vol. 6, Mar. 1933, pages 747-748. Discusses sal ammoniac, zinc ammonium chloride, and No. 20 galvanizing flux. AWM (8)

Some Reactions Occurring in "Hot-Dipping" Processes. Edward J. Daniels. *Sheet Metal Industries*, Vol. 6, Nov. 1932, pages 405-409. Paper before Joint Meeting of Institute of Metals and Iron & Steel Institute. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 68. AWM (8)

New Method of Hot Galvanizing. (Neuartige, feuerflüssige Verzinkung.) G. Huth. *Emailletechnische Monatsblätter*, Vol. 9, May 1, 1933, pages 38-39. New method for obtaining thin Zn coatings is described. The method is distinguished in that the coating speed can be increased considerably. The method is also applicable to tinning, Pb coating and Cd coating. GN (8)

Now You Can Spray Molten Metal. Paul Howard. *Modern Machine Shop*, Vol. 5, Jan. 1933, page 7-11. Principal methods of metal spraying methods are briefly explained and several examples of applying metallic coats on base metals shown. Under average working conditions with feeding a wire into a hydrogen flame following rates can be attained:

Zinc	120 ft.^{2} per hour per coat
Tin	120 ft.^{2} per hour per coat
Lead	120 ft.^{2} per hour per coat
Brass	80 ft.^{2} per hour per coat
Nickel Silver	50 ft.^{2} per hour per coat
Aluminum	60 ft.^{2} per hour per coat

Acetylene gas will give somewhat higher figures. Ha (8)

Cadmium Addition to Galvanizing Baths. Wallace G. Imhoff. *Heat Treating & Forging*, Vol. 18, Dec. 1932, pages 692-694, 698. Describes properties of Cd and discusses its effect in galvanizing baths. It is probable that its properties would be passed along to coating only in a very mild way, as only very small amounts are added to galvanizing bath. Cd lowers bath melting point and tends to thin out bath and to lighten weight of coating deposited. Heavy coatings and highest quality of galvanizing requires use of Cd-free Zn. Cd, in quantity usually added, has little effect on amount of skimmings produced and on character or quantity of dross produced. Bablik states that Cd in fairly large quantities increases weight of coating and impairs bending properties. Author has not observed any harmful influence directly attributable to small additions. Where a beautiful spangle is desired, Cd additions in small amounts are advisable. Preliminary tests in which Mg was added to galvanizing bath indicated that it gave coating a silvery appearance. No detrimental effects were observed. MS (8)

Metal Spraying Processes. (Das Metallspritzverfahren.) Walter Hahn. *Aluminium*, Vol. 14, Aug. 31, 1932, pages 2-4; Sept. 15, 1932, pages 1-2. The advantages of coating metallic structures with a protective coat of sprayed on metal instead of a paint are discussed. Several examples in buildings, ships and engines are described. The cost amounted in average to about 2.50 RM/m.^{2} for Zn spraying. Another use is found in repairing of smaller defects in castings which are filled up and often saves the replacement by a new piece. Ha (8)

INDUSTRIAL USES & APPLICATIONS (9)

Light Metals in Transport Engineering. Freeman Horn. *Metal Industry*, London, Vol. 42, Jan. 13, 1933, pages 39-42. Reviews use of light metals, in trucks, street cars, airplanes and motor cycles and describes briefly their physical properties. Ha (9)

Bearing Metals for Railway Rolling Stock. E. F. Ievers. *Railway Engineer*, Vol. 53, July 1932, pages 253-254. Prerequisites to be met by bearing metals and experiments and final solution by Sir Isaac Babbitt are fully dealt with. Experimenting over a number of years, author states that a Pb-base alloy involving a similar type of structure as Sn-base series show, are not inferior to latter. In an antimonial Pb, Sn-Sb crystals are replaced by crystals of Sb evenly divided. WH (9)

Stainless Clad Steel Readily Formed Into Tanks. S. L. Ingersoll. *Iron Age*, Vol. 130, Dec. 29, 1932, page 998, adv. sec. page 14. Describes construction of stainless steel clad tanks by Chicago Bridge & Iron Works. Walls and bottom of tank were constructed of 3/16" gage stainless clad steel having an 18-8 stainless surface with joints V-welded using stainless steel welding rod. Stainless surface embodies the exact degree of corrosion resistance present in solid stainless sheet of similar composition. The marked advantage of stainless clad steel is one of price. VSP (9)

The Malleable-Castings Industry in 1932. W. Edgar Hale. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, page 43. Use of malleable castings for ship-building, agricultural implements, automobiles, electrical goods, etc. is discussed. OWE (9)

Aluminum Plates and Foils for Photomechanic Printing. (Aluminiumplatten und-folien für den photomechanischen Nachdruck.) Karl Hansen. *Aluminium*, Vol. 15, Jan. 1, 1933, pages 4-5. Preparation of metal for making its surface sensitive to light and the treatment for developing the exposed picture is described. The purity and great uniformity and flexibility of Al make it very suitable for rotating presses, offset printing and many other multigraphing processes. Ha (9)

This is the age of metals and alloys. Whether it is a tiny piece of some relatively rare metal for a radio tube or a huge alloy forging for an oil still. These abstracts will tell you what is going on.

Rust- and Acid-Resisting Steels. W. H. Hatfield. *Metallurgia*, Vol. 7, Feb. 1933, pages 109-110, 129. Descriptive. Deals mainly with austenitic alloys, and describes some uses. Addition of W to austenitic alloys tends to prevent deterioration due to heating. JLG (9)

The Unrecognized Influencing Operative Details of Amalgam Management. W. E. Harper. *Dental Cosmos*, Vol. 75, Apr. 1933, pages 326-330. States that where their use is indicated high-Ag amalgams managed with the same understanding, care, and skill as required for Au will render better average service than Au, although less favorable in appearance. He considers that a moderate setting shrinkage is not a cause of leaks but attributes leaks to incorrect mixing and condensing. Slow-setting low-Ag alloys are considered unsatisfactory. Changes in mouth temperature may cause shrinkage and expansion to a maximum of 12 to 13 microns. Recommends using excess Hg to give a mix which borders on semi-fluidity and then removing the excess Hg during condensing, which he does with a burnishing instrument rather than by the more common packing technique. As filling of the cavity progresses less plastic material may be used. A matrix separator is recommended to save time and give proper atomical form. Alloys containing 66 to 69% Ag are favored. OWE (9)

Lead and Aluminum as Construction Material in the Artificial Silk Industry (Blei und Aluminium als Baustoff in der Kunstseiden-Industrie). Fritz Ohl. *Korrosion*, Vol. 7, Dec. 25, 1932, pages 45-46. Pb is extensively used in this industry because of its great resistance to attack of acids and alkalies; it must be very pure as impurities of As, Hg and Zn have proved to be harmful. Al is also used for certain machinery parts often as an alloy of 87% Al and 13% Si. Ha (9)

Alloy Iron Ring Carriers Reduce Cylinder Wear and Give Aluminum Pistons Longer Life. E. Mahle. *Automotive Industries*, Vol. 68, May 13, 1933, pages 578-582. The two most pressing problems that presented themselves when light-alloy pistons were first introduced for use in automobile engines were (1) best method of transmitting pressure from crown to bosses in this special piston type, and (2) assuring proper guiding of piston shirt in cylinder bore. After this, it was found that the light-alloy pistons still compared unfavorably with gray iron pistons in one respect—its ring-belt section had a shorter life. New Ni iron carrier has been produced which has same thermal expansion as Al and also maintains its hardness at elevated temperatures. Low temperature of ring section of light-alloy piston is combined with excellent wearing qualities of gray iron. This results in a greatly increased life of cylinder bores, rings, and ring grooves. DTR (9)

The Place of Nickel in Radio Tube Manufacture. A. J. Marino. *Electronics*, Vol. 6, Jan. 1933, pages 4-5. Ni is greatly used in the radio tube industry for plates, grids and filament supports on account of its easily obtained purity, high melting point and easy and convenient workability. Besides Ni-scrap commands a high price. Alloys which are extensively used are (1) Mn-Ni (2% and 5% Mn), (2) Ni 60%, Cr 15%, (3) Ni 80%, Cr 20%. The wire drawn is mostly 0.0001" and sheets from 0.0015" to 0.010", the tensile strength for hard drawn or rolled material is 90,000-110,000 lbs./in.^{2}. Ha (9)

New Armor Piercing Projectile. Correspondence from F. G. Martin. *Metal Progress*, Vol. 22, Aug. 1932, page 53. Describes a British developed armor piercing projectile which will pierce one foot of the best armor plate even when plate is inclined at an angle of 30° at a projectile velocity corresponding to a range of 10 miles. WLC (9)

Thermal Insulation with Aluminum Foil. Ralph B. Mason. *Industrial & Engineering Chemistry*, Vol. 25, Mar. 1933, pages 245-255. Thermal insulation with a metal is made possible by taking advantage of low thermal emissivity of Al foil and low thermal conductivity of air. Various factors determining efficiency of Al foil-air cell insulation are analyzed, and insulation values of a variety of structures determined experimentally in guarded hot plate apparatus or cold box apparatus. It is possible with this type of insulation practically to eliminate heat transfer by radiation and convection, and to approach insulating value of still air. Al foil-air cell insulations are found to be better than structures with corrugated separators or crumpled foil. Best results are obtained when distance between foils is from 0.25" to 0.33". Light weight of Al foil-air cell insulation and its excellent insulating properties make it especially suitable for use in the transportation industry. 21 references. MEH (9)

HEAT-TREATMENT (10)

Material Selection in "Caterpillar" Plants. G. C. Riegel. *Heat Treating & Forging,* Vol. 19, Jan. 1933, pages 11-12, 21-22. **Material Selection and Heat Treatment for Tractors.** *American Machinist,* Vol. 77, Feb. 1, 1933, pages 72-73. Describes briefly methods which maintain a steady flow of tested and heat-treated material to production so that no delay is encountered. Ha + MS (10)

The Heat Treatment and Use of Aluminum Alloys for Aircraft Structures. R. J. Anderson. *Fuels & Furnaces,* Vol. 10, Jan. 1932, pages 53-56; Feb. 1932, pages 133-136; Mar. 1932, pages 217-220. Principles, purpose and practice of heat treating of Al parts are explained, equipment for heat treating and quenching for Al alloys and the resistance to corrosive influences obtained by the treatment is described. Ha (10)

Why Heat Treatment of Steel in the Salt Bath? (Warum Wärmebehandlung von Stahl im Salzbad?) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, May 14, 1933, page 174. Discussion of the heat treatment of steel in carburizing salt baths and the advantages derived from this method. GN (10)

Hardening (10a)

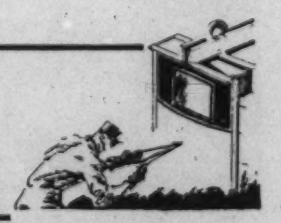
Non-distorting Tool Steels. I & II. J. Ferdinand Kayser. *Sheet Metal Industries,* Vol. 6, Mar. 1933, pages 721-723; Apr. 1933, pages 799-800. Discussion of difficulties attendant upon hardening of tool steels. 4 steels are discussed: 1. High C-Cr, 2. Co-Cr, 3. Mn tool steel. 4. Cr-Mn tool steel. Tables of dimensional changes on heating and curves showing quenching and tempering effects are included. AWM (10a)

Better Machine Bits. James Hyslop. *Mining Congress Journal,* Vol. 19, June 1933, page 22. Originally presented at the 10th Annual Convention of American Mining Congress, Pittsburgh, Pa., May 1933. The Walter Bledsoe Company has gone back to the old method of hardening the bit from the forging heat. The bits are heated in an oil-fired furnace and forged in a roller. A little time is allowed between the forging and the quenching process which takes away some of the brittleness. Tempering is done by placing the bits in a bath of fusible salt. As soon as the bits are drawn to 575° they are removed and allowed to cool in the air. The method adopted has resulted in a reduction of nearly 50% in bits used per ton of coal. Consumption of steel fell off 40% and sharpening cost dropped 31% per 1000 tons coal mined. DTR (10a)

Tool Hardening. I & II. J. Ferdinand Kayser. *Sheet Metal Industries,* Vol. 6, Jan. 1933, pages 575-576; Feb. 1933, pages 655-656. Discusses points which should control selection of a furnace e.g., size and heating capacity. Fundamental hardening principles are pointed out: steel must not be overheated, heated too quickly, or maintained at hardening temperature for an undue length of time, steel must be heated uniformly, and must be manipulated with care and due regard to size and shape. AWM (10a)

Is Your Heat Treating Plant Up-to-date?

This section digests the world's heat treating practices.

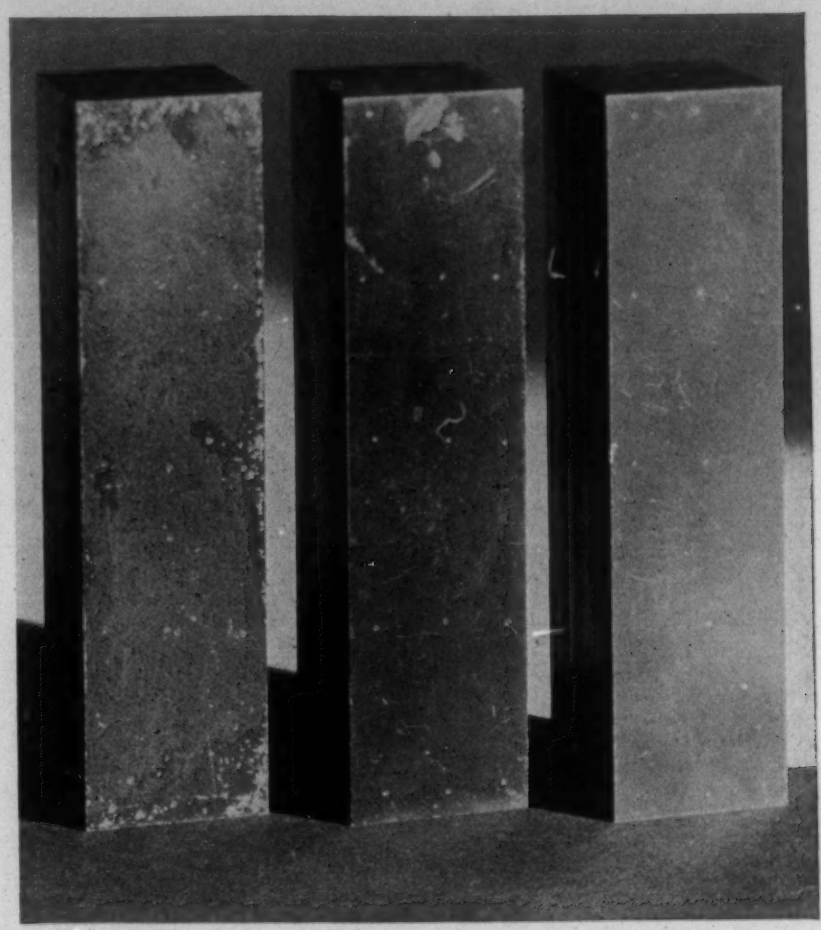


Annealing (10b)

Velocity of Softening of Deformed Metals by Recovery and Recrystallization. (Über die Geschwindigkeit der Entfestigung verformter Metalle durch Erholung und Rekristallisation.) F. Sauerwald & W. Globig. *Zeitschrift für Metallkunde,* Vol. 25, Feb. 1933, pages 33-38. In order to study the time laws of softening it is necessary to separate the effect of recovery (*Erholung*) and that of recrystallization. An attempt is made here to effect this separation for isothermal softening. Small cylindrical samples of Fe (H-purified mild steel) and Cu (electrolytic) were compressed at different temperatures by a falling hammer, the sample then held at the concerned temperature for various time periods for softening, then quenched and the Brinell hardness determined at room temperature. This hardness is proportional to the hardness measured at temperature and thus serves the purpose. Large-grained samples were used in order to be able to observe the formation of new grains. Cu compressed 19% at 375° C. softens from a hardness of 72 to 61 in 24 hours, but even in a very long time does not completely soften; no recrystallization obtains here, and the process is pure recovery. Recovery removes only a part of the hardening. The curve of softening of Cu compressed 20% at 400° (and also at 420°) shows several stages, the first corresponding to a slow rate (the period of induction) followed by a more rapid rate and then by a slower rate. The formation of new grains is slow up to 60 minutes, then suddenly very rapid, and subsequently slow again. The period of rapid growth is approximately that of rapid softening. In this case recrystallization is superimposed upon recovery. In order to study the temperature dependence of this superimposition samples of grain diameter 96-115 μ were compressed 20% and softened at 200°, 275°, 325°, 350°, and 375°. All these softening curves are similar in type except that at 375° in which samples recrystallization took place. The first part of the 375° curve (the induction period) is similar to the curves at lower temperatures, and the induction period is thus pure recovery. The effect of initial grain size was studied for 3 samples of average grain diameters 170, 140, and 115 μ, respectively, compressed 20% and softened at 375°; no recrystallization obtained in the sample of 17 μ in 24 hours, but in the 140 μ this was evident after approximately 3 hours, and in the 115 μ after 3 hours the sample was completely softened. Fe of average grain diameter 24 μ, compressed 8.6% and softened at 580°, showed pure recovery, no recrystallization, the hardness falling from 137 to 117 in 12 hours; the hardness of the completely soft sample was 100. A larger grain size, 300 μ, compressed 16% and softened at 600° showed pure recovery, no recrystallization; a grain size of 95 μ showed a similar behavior. A sample of grain diameter 48 μ showed recrystallization, evident on the softening curve after 80 minutes. At 630°, a 16% compression on a sample of 200 μ results in recrystallization after 45 minutes, with a characteristic induction period. In each case the rate of softening is greatly increased by recrystallization. Recovery in Fe is more effective in softening than recovery in Cu. It is not yet known whether, given sufficient time, recovery alone may entirely soften a deformed metal. RFM (10b)

The Annealing of Metal Strip in the Continuous Furnace. (Über die Glühbehandlung von Metallbändern in Durchziehöfen.) O. Junker. *Zeitschrift für Metallkunde,* Vol. 24, Dec. 1932, pages 301-302. Conclusion to previous article (*Zeitschrift für Metallkunde,* Vol. 24, 1932, pages 162-164). This section presents data on the effect of pickling between cold-rolling and annealing on the heating curve, and also on the effect of strip velocity on the heating curve. The rate of heating is dependent upon: temperature of furnace wall, material of furnace wall (radiation properties), radiation properties of metal strip, effective use of furnace width, and velocity of strip through furnace. RFM (10b)

VAPOCARB
HUMP HARDENED WORK



The Surface that Needs No Refinishing

Three specimens of oil hardening tool steel: from a good electric furnace (left); a good gas furnace (center); Vapocarb-Hump Furnace (right). Heated, quenched and oil wiped off . . . nothing more. Vapocarb-Hump hardened surface needs no refinishing.

Comes from the Furnace Clean

The controlled atmosphere in the Vapocarb-Hump Furnace prevents scale, pits and decarburization . . . without protective packs or coatings.

Refinishing to remove surface imperfections is ended. Surfaces come out of the furnace as smooth as they went in.

And because work comes clean from the furnace, it gets full benefit from the quench. Surface hardness is surprisingly uniform. But still more surprising, grain refinement for a given depth of hardness is remarkably improved.

With furnace atmosphere under Vapocarb control; heating rate under automatic heat-input control; and quench point under Hump chart control . . . Vapocarb-Hump hardening is more nearly perfect than any we have ever seen.

Write for Bulletin L-960-L
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VAPOCARB-HUMP HARDENING AVOIDS NEEDLESS TOOL EXPENSE
I-317

Heat Treatment of Metal Strip in the Continuous Furnace. (Über die Glühbehandlung von Metallbändern im Durchziehofen.) O. JUNKER. *Zeitschrift für Metallkunde*, Vol. 25, Feb. 1933, pages 45-49. New data on heat-treatment in the continuous furnace (cf. *Zeitschrift für Metallkunde*, Vol. 24, 1932, pages 162, 301). The Erichsen ductility values obtained from various heat treatments upon 3 brasses with 63% Cu, the first made from virgin metal, the second from 70% virgin metal and 30% scrap, and the third from scrap, are listed. The micrographic structures produced by each heat-treatment (and the accompanying Erichsen value) are illustrated. RFM (10b)

Case Hardening & Nitrogen Hardening (10c)

Steel Nitriding. (Note sur la nituration des aciers.) *La Technique Aéronautique*, Vol. 23, No. 3, 1932, pages 99-105. Results obtained on 12 different nitriding steels on Al-Cr, Ni-Cr-Al, Cr-Al-Ni-W, and Cr-Al-Ni-Mo base are presented, nitriding installation and its operation, application of nitriding process to airplane motor cylinders and advantages derived therefrom are discussed. WH (10c)

New Methods of Steel Hardening. (Neue Wege der Stahlhärtung.) *Schweizerische Technische Zeitschrift*, Vol. 30, Feb. 9, 1933, page 90-91. Discusses advantages derived from carburizing in molten cyanides. Carburizing time can be shortened considerably by the described "Durapid carburizing method" in which the pieces to be case hardened are heated for a few minutes above Ac_3 then dipped in the case hardening bath at normal temperature and finally hardened in the regular way. Advantages of this method are considered, as uniform heating of the material, accurate temperature control, uniform transition of the structure of case and core, no scaling, etc. GN (10c)

Nitriding of Steel. (Het netreeren van staal.) *Polytechnisch Weekblad*, Vol. 26, Apr. 14, 1932, pages 233-234. 17 analyses of suitable nitriding steels (Al, Cr, Mo, Ni, Si, V) are listed, procedure of nitriding process is detailed and distribution of hardness in a 1 mm. core of (1) Cr-Al-Mo, (2) Ni-Mo and (3) Cr-Mo steel is graphically shown. Commercial applications of nitriding process are taken up. WH (10c)

Hardening of Steel. (Härten von Stahl.) C. DINGELSTEDT. *Zeitschrift für wirtschaftliche Fertigung*, Mar. 1933, section Met, page 6. Discusses regeneration of superheated steel by the previously described compound "Restavem." Action of this compound and application are considered. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 72. GN (10c)

Chemical Control in Case-Hardening. Copper Plating for Protected Areas. *Chemical Trade Journal & Chemical Engineer*, Vol. 91, Aug. 5, 1932, pages 119-120. Cu plating for protection of certain areas in case hardening must be tenaciously adherent, continuous, fairly thick, and impermeable. These properties are controlled by correct cleaning, proper spacing in the plating vat, and the control of temperature, C.D., electrode spacing, composition of electrolyte and plating time. A method is described for determining the thickness of the Cu deposit. JN (10c)

New Methods of Improving Precious Metal Alloys. (Neue Wege zur Verbesserung von Edelmetall-Legierungen.) O. FEUSSNER. *Deutsche Goldschmiedezeitung*, Vol. 36, Apr. 8, 1933, pages 152-154. After the piece to be hardened has been worked in its soft original state, the base material is either coated with a paste which contains the diffusing metal or embedded in a hardening powder, then subjected to high temperature. So far such mixtures have been put on the market for Pt metals and their alloys. Method compares with the case hardening method for steel. GN (10c)

The Role of Energizers in Carburizing Compounds. GEORGE M. ENOS. *Transactions American Society for Steel Treating*, Vol. 20, July 1932, pages 27-57. Previously abstracted as Preprint No. 36, 1931. See *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 14. With discussion. WLC (10c)

Continuous Gas Carburizing—A New Technique. H. M. HEYN. *Steel*, Vol. 90, June 27, 1932, pages 23-25. In continuous gas carburizing of metal parts, a hydrocarbon gas is diluted with burned furnace gases and the mixture passed through a muffle furnace along with the work. The work passes through a series of successive temperature zones. The cooler zones cause a layer of C to deposit on the work, the hotter zones provide an active carburizing atmosphere of CO which acts on the surface of the metal to produce the case. Advantages claimed are greater economy, greater uniformity of carburized parts, and easier control of type of case produced. JN (10c)

Hardening in Molten Cyanide. H. N. BEILBY & W. NELSON. *Heat Treating & Forging*, Vol. 19, Jan. 1933, pages 23-25. Part of a paper read before the Birmingham Section, Society of Chemical Industry. See "Case-Hardening of Steel in Molten Sodium Cyanide," *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 117. MS (10c)

Nitricastiron. Cast Iron Suitable for Hardening by the Nitrogen-Hardening Process. J. E. HURST. *Foundry Trade Journal*, Vol. 48, Jan. 12, 1933, pages 19-20, 32; *Mechanical World & Engineering Record*, Vol. 42, Sept. 2, 1932, pages 213-215; *Metallurgia*, Vol. 8, May 1933, pages 25-27. Summary of processes of hardening cast Fe by N. Typical composition of a cast Fe which can be hardened by this process is given. Type of furnace used, possibility of selective hardening, type of surface obtained, and methods of removing internal stresses in casting are briefly discussed in succession. JLG + Kz + OWE (10c)

Investigations into the Nitrogen-Hardening of Steels. I. The Nitriding Properties of Nitralloy Steels, with Special Reference to the Effect of the Constituent Elements. B. JONES & H. E. MORGAN. *Iron & Steel Institute, Carnegie Scholarship Memoirs*, Vol. 21, 1932, pages 39-86. Study of effects, singly and in combination, of essential alloying elements of nitriding steels, Cr, Mo and Al. Hardness-depth and nitrogen-depth curves are shown. Effect of heat treatment prior to nitriding is discussed, a fine sorbitic structure results in best nitrided case. Fine carbides of sorbite interfere with growth of nitride plates of any size which are detrimental to hardness and toughness of case. Mo hardens case and core slightly, Cr hardens case and core more appreciably, Al induces great hardness within a narrow case. Addition of Cr to Al steel deepens and hardens case and addition of Mo further increases this effect. Authors describe their methods of dissolving surface layers for analysis where they are too hard to remove by machining with tungsten carbide tools. A very thin layer of high concentration of N and low hardness occurs on surface below which case has a very high hardness with a N content of about 10%. Low hardness of core is attained at a much shallower depth when N content of core is reached. Weight increases in nitriding are very closely proportional to amount of N absorbed. Much greater penetration of N occurs in Armco iron and mild steel than in alloy steels. 50 references. WLC (10c)

Special Uses and Newly Discovered Features of Nitrided Steels and the Nitriding Practice. WM. J. MERTEN. *Fuels & Furnaces*, Vol. 10, Mar. 1932, pages 197-198. Influence of slow cooling on increase of hardness by nitriding process is discussed and explained by precipitation and dispersion which require a certain time to produce maximum hardness. Advantages of CN over NH_3 nitriding are described and a list of applications for nitrided steels added. Ha (10c)

Special Methods of Nitriding without NH_3. WM. J. MERTEN. *Fuels & Furnaces*, Vol. 10, Feb. 1932, pages 121-124. Instead of using ammonia gas a cyanide immersion process for nitriding has been developed. NaCN is heated to the boiling point, the vapors pass through liquid or powdered Al or other Na and C absorbing metals and liberating nascent N which is then made to impinge on the steel part heated separately to the nitriding temperature. Some points to be considered in this process as regards heat treatment, flow of gas, gas pressure are dealt with. Ha (10c)

JOINING OF METALS & ALLOYS (11)

Soldering (11b)

Melting Points of Various Solders. *Sheet Metal Worker*, Vol. 23, July 1932, page 323. Following melting points are given for: 30 Sn 70 Pb—496° F.; 35 Sn 65 Pb—472° F.; 40 Sn 60 Pb—460° F.; 50 Sn 50 Pb—414° F.; 60 Sn 40 Pb—370° F.; 63 Sn 37 Pb—358° F.; 70 Sn 30 Pb—367° F.; Pure Sn—450° F. The equilibrium diagram Sn-Pb is given. Ha (11b)

Solder and the Art of Wiping Cable Splices. H. BAILLARD. *Bell Laboratories Record*, Vol. 11, Oct. 1932, pages 43-47. Soldered joints with Sn and Pb were first known in the 11th century. Making joints of Pb covered cables is especially treated, solders of 38% Sn, 62% Pb, or 24% Sn, 67% Pb and 9% Cd are mostly used. Cd replaces the more expensive Sn. The manipulation and qualities of different solders are described. Ha (11b)

Cadmium Plating as a Substitute for Tinning Prior to Soldering. *Machinery*, London, Vol. 41, Nov. 10, 1932, pages 149-153. Methods of tinning and cadmium plating are discussed and it is shown that economies can be secured by employing Cd. Experiments have proved that Cd-plated surfaces solder readily with better results than tinned surfaces. Kz (11b)

Welding & Cutting (11c)

Influence of Sequence in Welding upon the Tensile Strength of I-Beam Joints. (Der Einfluss der Reihenfolge der Schweissung auf die Festigkeit der Stösse von I-Trägern.) F. BOHNY. *Schweizerische Bauzeitung*, Vol. 101, Apr. 29, 1933, pages 200-202. Report on results of investigations on above subject carried on by Patton & Koslowsky at the Ukrainian Academy of Science. The beams investigated were welded in correct and incorrect sequence. Improper sequence of the welding procedure decreases the bearing power of the beams up to 10%. In joining several beam parts to a whole the investigators propose the following rule: First weld the joints of the steel plates starting from the middle to the outer parts, then welding-on the cover plates, beginning with the tension plates. The joints of the web plates should be reinforced by fish plates. GN (11c)

Fusion Welding of Aluminum and Its Alloys. (Das autogene Schweissen von Aluminium and seinen Legierungen.) H. BOHNER. *Zeitschrift für Metallkunde*, Vol. 25, Feb. 1933, pages 50-52. Polemic with H. Buchholz (*Zeitschrift für Metallkunde*, Vol. 24, 1932, pages 19-22), on the ductility of welds in Al alloys. H. Buchholz, *Zeitschrift für Metallkunde*, Vol. 25, Feb. 1933, page 52. Reply. RFM (11c)

Have You a Joining Problem?

From January to July 1933 this section digested 399 articles on welding, cutting, soldering, brazing and riveting.

Fusion Welding for Structural Steel Work. (Die autogene Schweissung im Stahlbau.) C. F. KEEL. *Der Autogen Schweisser*, Vol. 5, Sept. 1932, pages 204-205. Deals with utilization of fusion welding for steel construction, physical properties of welded seams, and results of experiments. The mean breaking load from several tests on equally sized plates yielded 56.1 t. for fusion welding plate and 38 t. in case of riveting. During oscillating stress tests at 1200 + 400 kg./cm.^{2} tension 2 riveted test-pieces broke at 397,000 and 857,000 changes in direction of force, while 2 fusion welded test-pieces of the same dimensions withstood 2,424,000 and 5,308,000 changes respectively. Attention is called to the elongation diagrams of riveted and gas-welded test-pieces. Kz (11c)

Vacuum Tube Control applied to Spot Welding Equipment. E. U. LASSEN. *Welding Engineer*, Vol. 18, Jan. 1933, pages 28-29. The tube timer is adjusted so that current is on just long enough to assure a good weld without burning material. Timer contains a thyratron tube controlling current relay and is itself controlled by a condenser of a definite electrical charge depending on work to be done. Ha (11c)

Repairs to Railroad and Highway Bridges by Electric Welding. A. G. LEAKE. *Journal American Welding Society*, Vol. 12, Feb. 1933, pages 30-31. Extract of paper presented at the Feb. 8th Meeting, Cleveland Section, A. W. S. Describes a method of repairing and strengthening steel bridges by means of arc welding. TEJ (11c)

Boltless Connections for Welded Structures. A. G. LEAKE. *Journal American Welding Society*, Vol. 12, Jan. 1933, pages 28-29. Describes a new connection designed for field erection of welded structures and tells of its advantages. TEJ (11c)

Structural Welding is Valuable Tool. A. G. LEAKE. *Industry & Welding*, Vol. 5, Feb. 1933, pages 13-17, 29. Welding methods eliminating bolting or riveting to hold the steel parts in place are described, the usefulness of welding in maintenance work especially of bridges is pointed out. Ha (11c)

New Manipulation of the Burner of Gas Cutting Machines. (Eine neuartige Steuerung des Brenners bei Autogen-Schneidemaschinen. R. LEONHARDT. *Der Autogen Schweisser*, Vol. 5, Sept. 1932, pages 202-203. After discussing different methods of flame guidance the "Pantosec," a gas cutting machine of Messer & Co., Frankfurt a.M., is described. The machine has a burner operated by a steering wheel allowing the cutting of figures drawn on the work pieces. Kz (11c)

Automatic Arc Welding. (Die automatische Lichtbogenschweissung.) R. LEONHARDT. *Elektrowärme*, Vol. 3, Jan. 1933, pages 11-13. Character of the electric arc, the absorption of N and O as dependent on the current, and the polarity of the electrode according to whether a welded joint is to be made (negative) or simply material deposited (positive) is discussed. Automatic welding machines should maintain a short arc since a long arc increases the amount of injurious constituents and also deteriorates the structure. The feeding of the wire must be very sensitive to follow the fluctuations of the arc. Several constructions of machines and control devices are described. Ha (11c)

Stainless Steels and Their Treatment. F. LEVERICK. *Welder*, Vol. 4, Nov. 1932, pages 15-21. Alloyed stainless steels require a special treatment in welding, due to high Cr-content effects of oxy-acetylene; oxygen and fusion welding processes are described. Carbon arc cannot be used generally in welding these steels because weld absorbs a considerable amount of C from the rods employed, and serious increase of C in the weld gives rise to mechanical and chemical trouble. The best method is the atomic hydrogen arc welding as the H-atmosphere prevents the formation of oxides. Whatever method is used the removal from the weld of all traces of slag, scale, etc. is essential; otherwise cavities can form causing corrosion to set in. Effective scale removal pickles are given. The steels are grouped in 6 classes, according to their chemical composition; proper treatment before, during and after welding for each group is discussed. Ha (11c)

Maintenance of Equipment by the Oxy-acetylene Method. L. H. Scheifele. *Journal American Welding Society*, Vol. 12, Mar. 1933, pages 15-17. Paper read before the 33rd Annual Convention, International Acetylene Association, Philadelphia, Nov. 1932. The author reviews briefly the history of welding, basic principles of the heating and cooling of metals, fundamental requirements of oxy-acetylene operators, and various applications of oxy-acetylene welding in locomotive and car shops. TEJ (11c)

Gas Welding in a Railroad Shop. L. H. Scheifele. *Welding Engineer*, Vol. 18, Apr. 1933, pages 21-22. Experiences and practice of the Reading Co. are discussed. Savings of 25% were made by gas welding over thermit welding and workmanship was higher. Ha (11c)

Some Economic Aspects of Welding Aluminum. D. E. Roberts. *Paper* presented before the *International Acetylene Association*, Philadelphia, Nov. 1932, 3 pages; *Journal American Welding Society*, Vol. 12, Feb. 1933, pages 18-20; *Metal Industry*, N. Y., Vol. 31, Feb. 1933, pages 61-62. A comparison of costs of welding Al by means of the oxy-hydrogen and the oxy-acetylene methods. TEJ+Ha (11c)

Welding of Steel Girders. (Schweissen von Blechträgern.) H. Kruse. *Azetylen in Wissenschaft und Industrie*, Vol. 35, Feb. 1932, pages 23-29. See *Metals & Alloys*, Vol. 3, June 1932, page MA 176. WH (11c)

Economic Advantages of Welded Piping in Homes. Fred J. Maeurer. *Journal American Welding Society*, Vol. 12, Feb. 1933, pages 4-6; *Welding Engineer*, Vol. 17, Dec. 1932, pages 15-18. Paper presented at 33rd Annual Meeting, International Acetylene Association, Philadelphia, Nov. 1932. Discusses advantages of welded piping in homes, with particular reference to efficiency and cost. TEJ+Ha (11c)

Non-Ferrous Metals. M. Powell & I. T. Hook. *Welding Engineer*, Vol. 17, Apr. 1932, pages 25-26. Abstract of paper on welding of Everdur read before the American Welding Society. See "Large Welded Everdur Pressure Vessels," *Metals & Alloys*, Vol. 3, Feb. 1932, page MA 43. Ha (11c)

Comparative Investigations of Mechanical Properties and Structure of Differently Manufactured and Subsequently Treated Welded Seams in Thick Sheets with Particular Consideration of Tube Manufacture. (Vergleichende Untersuchungen über die mechanischen Eigenschaften und das Gefüge verschiedenartig hergestellter und nachbehandelter Schweissnähte in Grobblechen unter besonderer Berücksichtigung der Rohrherstellung.) K. Wallmann & A. Pomp. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, No. 19, 1932, pages 271-294; abstract, *Die Elektroschweissung*, Vol. 4, Mar. 1933, page 56. Usual welding methods for hollow bodies and their suitability for automatic operation are reviewed. The following 5 processes were compared by tests: (1) machine water-gas welding, (2) manual fusion welding, (3) manual metal-arc welding with coated electrode, (4) automatic metal-arc welding with bare electrode under H-application, (5) automatic carbon-arc welding under H-application; tests were made on 15 and 8 mm. thick sheets which had been heat-treated. Tensile strength, elastic limit, elongation, reduction of area, bending strength and notch-toughness in and adjacent to the welded seam were determined, the results are given in detail in charts and tables. Watergas welding gave good properties; this method should be applied whenever an especially high-quality weld is required, in particular for greater thicknesses. Fusion welding with subsequent forging and manual arc-welding with covered electrode produces a tough, ductile seam; both methods can be used for larger thicknesses. Automatic metal-arc welding with bare electrode produces less tough welds, while automatic carbon arc welding gives good mechanical properties which can still be improved by refining and is very suitable for hollow bodies of medium pressures up to 12 mm. wall thickness. Forging of a weld always improves the mechanical properties; a thermal treatment showed an advantage only for the carbon arc. With regard to judging the quality of a weld it is more reliable to consider the distribution of the elongation over the tested length than the elongation at fracture reduced to the tested length. The tested specimens were also examined as to their structure. 36 references. Ha (11c)

Are Oblique Buttjoints Stronger than Transverse Butt Joints? (Sind Schrägstösse fester als Querstösse?) Otto Mies. *Die Schmelzschweissung*, Vol. 11, Nov. 1932, pages 234-237. An analytical treatment of forces in welded joints when the butt is not made, as usual, in a right angle to the axis of the pieces to be joined but in some other angle. Dependence of tensile and compression forces on angle of plane of welding to axis is shown in space-diagrams and it is found that practically no advantages can be derived from oblique butt joints. Several examples are calculated for different materials. Ha (11c)

Electric Welding Repairs Waterwheel Runners. M. O. McKinney. *Electric World*, Vol. 100, Nov. 5, 1932, pages 622-623. Cast Fe and steel runners pitted and worn by erosion are repaired by depositing electrically welded metal. CBJ (11c)

Contribution on the Development of Welded Frame Joints without Diagonals. (Beitrag zur Ausbildung geschweisster Rahmenanschlüsse ohne Schrägen.) Paul Michnik. *Der Bauingenieur*, Vol. 13, Oct. 21, 1932, pages 542-544. It is shown that forces present in frame joints can effectively be taken up by weld seams. GN (11c)

Welding in the Construction of Transportation Means (Fahrzeugbau. Ausgewählte Schweisskonstruktionen.) Assembled by Ernst Kalisch. VDI Verlag, Berlin, 1933. Cloth, 8½x11½ inches, 90 loose leaves. Price 12.50 RM. This book is Vol. 4 of a series prepared with the cooperation of the German Electric Welding Society and of the German carbide and acetylene industry. The book is really an album showing how welding can be used in the assembly of agricultural machinery, street cars, automobiles, conveyor systems, mine and dump cars, passenger and freight cars and aeroplanes. The other volumes covered: Vol. 1. Welding of Structures; Vol. 2. Welding in Machine Construction; Vol. 3. Welding in Pipe Lines and Storage Tank Construction.

Of the 90 examples illustrated only 4 were the work of companies outside of Germany: one by the Pullman Car & Mfg. Co., showing a Chicago Great Western hopper car and three by Fokker, showing aeroplane fuselage connection details. The illustrations and printing are excellent. Richard Rimbach (11c)-B-

Electric Arc Welding. (Elektrische Lichtbogenschweissung.) K. Mueller. 2nd Edition. S. Hirzel Verlag, Leipzig, 1932. Paper, 7x10 inches, 398 pages. Price 27.80 RM. This is Vol. 3 in Philippi's series on Electricity in Industrial Operations. The first edition appeared in 1925. It is a general handbook, dealing with the design of welding equipment, with welding materials and methods, for bare and coated metal-arc and carbon-arc welding, with engineering design of welds and with the economics of welding. Methods for ascertaining the cost of making a given length of weld are shown in many curves. Most attention is paid to welding of steel of the usual structural grades. Welding of cast Fe receives some comment, that of austenitic steels, Cu, Al and Pb, very brief mention. Arc-cutting is discussed. The usual destructive tests for welds are described, as are radiography and magnetic testing, especially with iron-dust.

Many examples of welded construction and repair are described and illustrated. The treatment is, on the whole, from the engineering point of view. The metallurgical fundamentals are briefly dealt with.

The equipment described is, of course, chiefly German, and the book is written largely on the experience of the Siemens-Schuckert Company, but will be of value to welding engineers anywhere. It is profusely illustrated, and well printed on good paper. H. W. Gillett (11c)-B-

Brass and Bronze Welding. D. E. Roberts. *Industry & Welding*, Vol. 5, Feb. 1933, pages 24-28. Commercial brasses and bronzes can be successfully welded by oxy-acetylene with an oxidizing blow-flame. Examples of ornamental work are illustrated. Ha (11c)

Electric Arc-Welding of Non-Ferrous Metals. H. Martin. *Mechanical World & Engineering Record*, Vol. 92, Aug. 19, 1932, pages 165-166. Advantages of electric arc-welding are intense local heat, speed of metal deposition, absence of burnt gas by-products. Preheating (local, or in furnace) is necessary when electric arc-welding is carried out on Cu. Owing to hot-shortness of Cu, large electrodes should be used and the weld completed in one run. Discussion of electrodes. Best results have been obtained by the use of bronze core wires, suitably coated and used on direct current. Hard-drawn wire gives a much steadier and concentrated arc than annealed wire in Cu arc-welding. Results on Cu are not as good as those obtained by acetylene welding. Improvements possible by the use of heavily coated electrodes with high arc voltage. On account of the affinity between Cu and H, welds made by the atomic hydrogen process are rendered porous. Bronze and brass over ⅛ in. thick have to be preheated and slowly cooled. For arc-welding of Ni and Monel metal Murex electrodes are recommended. Care has to be taken that no flux is entrapped in the weld metal. Exceptionally large electrodes are used for Al arc-welding. Material thicker than ⅛ in. should be bevelled. Preheating is necessary. Kz (11c)

Electrodes for Resistance Welding Machines. (Elektroden für Widerstandsschweissmaschinen.) Eberhard Rietsch. *Die Elektroschweissung*, Vol. 4, Mar. 1933, pages 51-54. Discusses welding occurrences in butt welding, spot welding, and projection welding. Results of welding tests with 7 types of electrodes are given. Spot welding tests on non-ferrous metal sheets were made, Cu sheets are best welded with pure W electrodes, brass is best welded with Bombit (Ag-Cu) electrodes, with Al the quality of the sheet used is of main importance. Similarly electrodes for projection and butt welding are considered. The best electrodes in welding Fe, steel, Cu, brass, duralumin, Al, Elektron and Zn are tabulated. GN (11c)

High Capacity Electric Spot Welding Machines. (Elektrische Punktschweissmaschinen grosser Leistung.) E. Rietsch. *Die Werkzeugmaschine*, Vol. 37, Jan. 15, 1933, pages 11-12. High capacity spot welding machines are described. They must meet following requirements: (1) Increased distance of the electrodes to facilitate the welding of bulky pieces, (2) decrease of welding time, thus increasing the output, (3) possibility of welding metals with lower electric resistance than Fe, (4) possibility of welding in special cases, (5) use of currents up to 150 KVA. GN (11c)

Development of Electric Welding and Its Importance. (Die Entwicklung der elektrischen Schweissung und ihre Bedeutung.) Carl Ritz. *Elektrowärme*, Vol. 2, Sept. 1932, pages 201-205. Many examples illustrate progress made in many fields of manufacturing by employing electric resistance or arc welding, not only for finished products but also for fixtures and tools simplifying welding of former. Ha (11c)

Welding with Copper Alloys. G. T. Piersol. *Journal American Welding Society*, Vol. 12, Feb. 1933, pages 22-24. Paper presented at Nov. 17, 1932, Meeting of Los Angeles Section, A. W. S. Discussion of proper welding technique for the various brasses and bronzes, with some data on strength of the joints. TEJ (11c)

Viewpoints on Fusion Copper Welding. (Gesichtspunkte bei autogenen Kupferschweissungen.) A. Nauck. *Der Autogen Schweisser*, Vol. 5, Sept. 1932, pages 198-200. Methods and materials used to secure proper Cu-welding and to avoid brittleness by Cu_2O formation are discussed. Attention is called to the welding rod designated as "Canzlerdraht." The latter represents a Cu alloy containing P and Ag, which lower the melting point of pure Cu and prevent oxidation during welding operation. Experiments proved that hammered weld built up by "Canzlerdraht" has almost same properties as rolled Cu in addition to a higher density and strength than electrolytic Cu. Kz (11c)

Welding Copper Alloy Tanks with Carbon Arc. *Welding Engineer*, Vol. 18, Apr. 1933, page 13. Carbon arc welding of Everdur shells for hot water heaters is described; no filler material was applied and a water-tight joint was obtained. Ha (11c)

Welding at the Works of Robert Jenkins & Co., Ltd. *Welder*, Vol. 4, Nov. 1932, pages 8-13. Examples of welded construction work of large dimensions, as tanks, coolers, hoppers, etc. by electric welding are described. Ha (11c)

Electric Arc-Welding at Messrs. A. Reyrolle and Co., Ltd., Hebburn-on-Tyne. *Welder*, Vol. 4, Jan. 1933, pages 6-15. Interesting applications of arc welding in a large switch-gear manufacturing plant. TEJ (11c)

Arc Welding for the Construction and Repair of Ships. *Welder*, Vol. 4, Jan. 1933, pages 15-23. Regulations recently adopted by English and German marine insurance companies are discussed; requirements for workmanship, details of construction and a series of tests for determining suitability of electrodes to be used are briefly described and principal faults to be found with arc-welds and their causes are explained. Precautions to avoid faulty workmanship are suggested, and coöperation of designer and welding shop urged. An example of a welded ship is described. Ha (11c)

Cutting in Preparation for Welding. Everett Chapman. *Paper presented to the International Acetylene Association*, Philadelphia, Nov. 1932, 4 pages. Advantages of gas cutting in structures are discussed with particular regard to construction of shears, crushers, punch presses, etc. Proper design for this method is emphasized. Ha (11c)

Welding Facilitates Use of Stiffest Shapes for Machine Tool Loads. Everett Chapman. *Iron Age*, Vol. 129, Apr. 28, 1932, pages 972-974. Abstract of paper read before the Metropolitan and Plainfield (N. J.) section of A. S. M. E. Stiffness, particularly torsional stiffness, necessary in machine tools, is provided by completely closed and tubular structural sections. Most troubles with welded steel construction will be in the design rather than in material or fabricating process. VSP (11c)

Modern Practices in Bridge Re-Decking. William F. Carson. *Engineering News-Record*, Vol. 110, Jan. 19, 1933, pages 86-89. Many of the early steel and wrought iron highway bridges are too light, too narrow or have so deteriorated that they should be scrapped. Yet there are thousands which can be repaired and strengthened at small cost. Arc welding plays an important role in this work. Three such jobs are outlined in detail. CBJ (11c)

An Improved A.C. Arc Welder. A. M. Candy. *Transactions American Institute of Electrical Engineers*, Vol. 51, June 1932, pages 567-569. Includes discussion. In order to make a.c. current as efficient and convenient as d.c. for welding by lowering open circuit voltage and striking arc easier, and by improving power factor, ordinary welding transformer is used in connection with superimposed high-frequency oscillations on welding circuit. Oscillator circuit is formed by a small standard transformer, condenser and 2 spark gaps with an air choke coil. While voltage of main transformer is only about 70 volts, the oscillator circuit develops a high enough voltage to ignite arc without danger to welder as high-frequency is harmless due to skin effect. Method is described in detail. Ha (11c)

Atomic Hydrogen Arc Welding and Its Applications. J. A. Dorrat. *Welding Journal*, Vol. 30, Jan. 1933, pages 6-16. Paper read before the Members of the North-western Branch of the Institution of Welding Engineers, Oct. 26, 1932. Includes discussion. A comprehensive discussion of atomic hydrogen welding which covers the theory of the process, equipment, welding technique, design of joints, properties of mild steel welds, welding brass and bronze, copper and aluminum, special equipment, welding speeds, tungsten and hydrogen consumption. Because of the high temperature of the hydrogen flame and the reducing action of atomic and molecular hydrogen, this process has a large field of usefulness in welding many metals and alloys. TEJ (11c)

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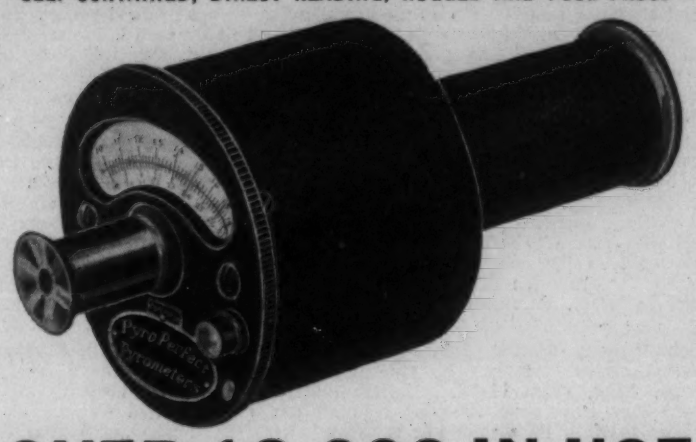

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The Use of Electric Arc Welding in Warship Construction. C. S. Lillicrap. *Engineering*, Vol. 135, Apr. 14, 1933, pages 419-421; Apr. 21, 1933, pages 442-443. Includes discussion. Condensed from paper read before the Institution of Naval Architects, April 6, 1933. LFM (11c)

1 **Automatic Arc Welding in a Modern Tank Shop.** R. B. Lincoln. *Machinery*, Vol. 38, Feb. 1932, pages 401-406. Description of plant, equipment, and methods in use at the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Emphasizes value of automatic welding and devotes most space to description of equipment rather than methods. RHP (11c)

Welding Wires, Hard Solders and Fluxes for Non-Ferrous Metals. (Ueber Schweissdrähte, Hartlote und Flussmittel für Nichteisenmetall.) Erich Lueder. *Autogene Metallbearbeitung*, Vol. 25, Oct. 15, 1932, pages 305-312. Great importance of nature and application of additional material in welding is pointed out and phenomenon of melting of a welding rod and its junction with metal parts to be welded discussed. Part of flux is explained and qualities of a good flux enumerated; tests to which a flux should be subjected are described. Requirements in special cases, that of welding Ni, bronze, brass, cast Fe, Ag solders are discussed and illustrated by equilibrium diagrams and microphotographs. Ha (11c)

2 **Brittleness of Galvanized Welds. (Brüchigkeit von verzinkten Schweissnähten.)** Kalisch. *Die Schmelzschweissung*, Vol. 11, Dec. 1932, pages 265-266. A close investigation of the phenomenon that often the material at the weld becomes brittle after galvanizing reveals that the treatment before galvanizing is the reason, and that the black Fe_3O_4 in the scale must be thoroughly removed as it often retains diluted acid which later attacks the weld. The welding wire should have a very low P and S content and the weld be annealed before pickling and dried several hours before it is galvanized. Ha (11c)

Autogenous Welding in Italy. (Die Autogene Schweissung in Italien.) C. F. Keel. *Zeitschrift für Schweisstechnik*, Vol. 23, Feb. 1933, pages 50-55.

3 Italian bureau of control of ship and airplane construction has passed a new set of rules relative to welding, permitting use of fusion welding in ships and airplanes. Fusion welding may only be used when parts to which it is applied are free to expand and then to contract on cooling. Specifications given refer to type of material to be welded, type of weld, welder, and kind of welding rod. RRS (11c)

Welding Rods with Angular Profiles make Possible an Increase of 20-25% in Speed of Welding and a Corresponding Reduction in Gas Consumption. (Zusatzdrähte mit eckigen Querschnitt ergeben Schweissnähte von 20-25% grösserer Schweissgeschwindigkeit und dementsprechend geringerem Gasverbrauch.) C. F. Keel. *Zeitschrift für Schweisstechnik*, Vol. 23, Feb. 1933, pages 38-41. Use of angular rods, either triangular or rectangular, permits use of stronger torches

4 with a resultant increase in welding speed and reduction in cost. Table gives results obtained from welding with round, triangular, and rectangular rods. RRS (11c)

Track Welding Practice Shows Marked Advance. William Spraragen. *Journal American Welding Society*, Vol. 12, May 1933, pages 24-26; *Transit Journal*, Vol. 77, Feb. 1933, pages 54-56. Brief review of report of Committee on Welded Rail Joints. Cast joint, bar joint, butt joint, seam-welded joint and thermit joints are discussed with reference to physical properties, methods of making joints and equipment used. TEJ+CBJ (11c)

Visual Inspection of Metal Arc Welds. Frank B. Walker. *Journal American Welding Society*, Vol. 12, Apr. 1933, pages 16-18. Paper presented at meeting of Boston Section, American Welding Society. See "Quality of Welds may

5 be Determined by Visual Inspection," *Metals & Alloys*, Vol. 4, Apr. 1933, page MA 119. TEJ (11c)

Welded Steel Frame for the University of California Medical School Building in San Francisco. Edward M. Knapik. *Journal American Welding Society*, Vol. 12, Apr. 1933, pages 11-13. **Hospital Addition Introduces Welding in San Francisco.** *Engineering News-Record*, Vol. 110, Feb. 16, 1933, pages 222-223. Paper presented at the Nov. 22, 1932, Meeting, San Francisco Section, American Welding Society. Some details of connections in a riveted and welded steel frame building. All direct loads were transmitted through shop riveting while field welding was used to secure members to these shop riveted connections and for securing necessary lateral bracing. CBJ + TEJ (11c)

6 **Special River-Sea Bulk Cargo Arc-Welded Ship.** G. F. Wahl & H. E. Johns. *Journal American Welding Society*, Vol. 12, Feb. 1933, pages 7-9; *Marine Engineering & Shipping Age*, Vol. 38, Feb. 1933, pages 48-49. Brief of a paper submitted for the Second Lincoln Arc Welding Prize Competition. In order to design a vessel to resist the hard wear of heavy seas, yet navigable in shallow river channels and withal large and fast enough for easy rentability, arc welding was resorted to at all points where stresses and strains were present. Kz+TEJ (11c)

Spot-Welding the Stainless Steels. V. W. Whitmer. *Welding Engineer*, Vol. 17, Oct. 1932, page 33; *Welding News*, Vol. 3, Oct.-Dec. 1932, page 49; *Automotive Industries*, Vol. 68, Jan. 21, 1933, page 76. General remarks on how to carry out spot-welding on stainless steels. Ha+DTR (11c)

7 **Elongation at Rupture of Welds. (Die Bruchdehnung von Schweissungen.)** A. Sonderegger. *Zeitschrift für Schweisstechnik*, Vol. 23, Feb. 1933, pages 30-34. A groove is cut part way through a sheet and is filled in by welding. Sheet is then turned over and operation is repeated to give a solid strip of welded material. This strip may be made large enough so that a test piece may be cut from it. Objections to results obtained by this method are that they may lack in consistency due to inclusions in welds, and that there is some question as to whether results obtained in this way are comparable to conditions in actual welds. Author proposes a tensile test for lengthwise welds in steels of various tensile strengths. RRS (11c)

Synopsis and Conclusions Paper on Tests of Riveted and Welded Steel Columns. Willis A. Slater & M. O. Fuller. *Journal American Welding Society*,

8 Vol. 12, Feb. 1933, pages 20-21. From paper published Sept. 1932, *Proceedings American Society of Civil Engineers*. Tests of riveted and welded steel columns show little difference on strength of the 2 types. TEJ (11c)

Burning Through Metal Barriers Under Water. R. G. Skerrett. *The Welding Journal*, Vol. 30, Mar. 1933, pages 78-82. Reprinted from the *Compressed Air Magazine*, Jan. 1933. Some interesting applications of under-water cutting with the oxy-electric lance. A description of the blowpipe and the history of its development are included. TEJ (11c)

A Survey of Metallic Arc Welding. D. G. Sinfield. *Sheet Metal Industries*, Vol. 6, Apr. 1933, pages 817-20. Paper before Institution of Welding Engineers. A general discussion favoring basic-fluxed rods. AWM (11c)

9 **Where the Oxyacetylene Flame and the Electric Welding Arc Join Forces.** O. Simonis. *Welding Journal*, Vol. 30, Mar. 1933, pages 72-76; Apr. 1933, pages 112-114. Paper read before Institution of Welding Engineers, Feb. 15, 1933. Includes discussion. Borderline between oxyacetylene and arc welding is, in practice, drawn by 2 main considerations, namely: (1) those of economics as to which gives the cheaper weld under given conditions and, (2) which gives the lesser distortion. Oxygen and the electric arc definitely join forces where oxygen cutting is employed to get the work ready for fabricating into units with the electric welding arc. The author shows many illustrations of this practice as it is used in the replacement of castings or riveted construction. TEJ (11c)

Practical Points on Welding Aluminum. Ed. Searles. *Machinery*, Vol. 38,

10 Feb. 1932, pages 536-537. Welding of sheet Al is same as light-gage sheet steel except that a small lead burner torch is used instead of a large torch. Flange type weld is preferable to butt joint. ⅛" right angle flange is clamped and tack-welded with pure soft Al wire 1/16" to ⅛" diameter. "Neapolitan" Al welding flux, manufactured by Air Reduction Sales Co., and Al welding flux, manufactured by the Aluminum Co. of America have proved satisfactory. Use neutral flame. Gives several other suggestions on proper technique for the welding operator. RHP (11c)

WORKING OF METALS & ALLOYS (12)

Hard Quality Alloys of Copper. (Harte Qualitätslegierungen des Kupfers.) K. Ewig-Daues. *Zeitschrift für Metallkunde,* Vol. 24, Sept. 1932, pages 214-220. Includes discussion. Paper before Deutsche Gesellschaft für Metallkunde, June 26, 1932. General description of manufacturing process, including melting, protection from oxidation, ingot practice, rolling, alloy constitution, for alloys in systems Cu-Sn, Cu-Al, Cu-Zn, including data on effect of cold-rolling up to 50% on the Brinell hardness (5 mm. ball, 250 kg. load, 30 sec. application of load) of alloys: Cu 98%, Sn 2; Cu 94, Sn 6; Cu 92, Sn 8; Cu 86, Sn 4, Zn 10. RFM (12)

Melting & Refining (12a)

New Deoxidation Process on a Phosphorus Basis. (Nouveau Procede de Desoxydation a Base de Phosphore.) Willi Claus. *Revue de Fonderie Moderne,* Vol. 26, Sept. 25, 1932, pages 349-350. Instead of expensive Cu phosphide and Sn phosphide for the deoxidation of metals a compressed powder of red phosphorus and Zn containing about 10 to 20% P has been found to give the same or even better results. It is a cheaper method, easily handled as it is a very dense and homogeneous product, dissolves quickly and distributes easily in the molten mass and gives better values of tensile strength and elongation than for material deoxidized with Cu phosphide. Ha (12a)

Production of Steel for Piano Wire in an Open Hearth Furnace. A. Shevtschenko. *Domez,* No. 10, 1932, pages 28-30. (In Russian.) A heat made in a 7 ton basic open hearth furnace is described in detail. (12a)

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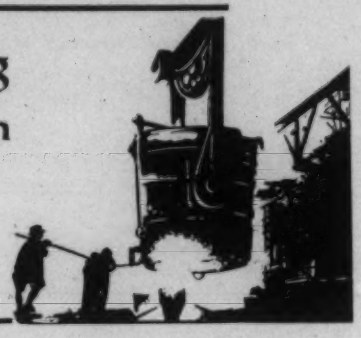

Free Energy of Iron Oxides. John Chipman & Donald W. Murphy. *Industrial & Engineering Chemistry,* Vol. 25, Mar. 1933, pages 319-327. Application of thermodynamics to problems of steel manufacture is discussed, and desirability of obtaining a complete table of free energies at steel-making temperatures is shown. Data on thermal properties of Fe are reviewed, and from these are derived equations for free energy of various forms of Fe referred to beta Fe as a convenient reference state. Data on heat capacities of ferric oxide and magnetite are reviewed and empirical equations derived. An approximate expression for ferrous oxide is deduced from Kopp's rule. Roth's data on heat of formation of ferrous oxide and magnetite are in agreement with those of International Critical Tables. Differences in regard to ferric oxide are adjusted on basis of Roth's heats of solution. Free energy of ferrous oxide is obtained from its reduction equilibria involving H and CO. Heat of fusion of ferrous oxide, deduced from equilibrium measurements, is used in extrapolating its free energy to steel-making temperatures. On basis of solubility measurements of Herty and of Körber, an expression for molal free energy of ferrous oxide dissolved in liquid Fe is derived. Free energy of ferroferric oxide is obtained from that of ferrous oxide at quadruple point (565° C.) involving phases Fe, ferrous oxide, ferroferric oxide, gas. This is found to agree with that calculated from Millar's determination of entropy of magnetite. An approximate expression for free energy of ferric oxide is obtained from thermal data. 39 references. MEH (12a)

Effect of Temperature and Stirring on Cast Iron. Detroit Electric Furnace Co., mimeographed report, Mar. 16, 1933, 8 pages. Report of tests at Atlas Foundry Co. on cast iron of 3.40% total C, 1.65% Si melted in a rocking electric furnace, operated without rocking and with various times of rocking, and poured at different temperatures. Composition of castings did not vary. Microstructure showed less graphite and finer and better distributed flakes with increase in temperature and stirring. Machinability also improved. Test results were:

No.	Furnace	Pour. Temp. °F.	Tensile lbs./in.²	Transverse lbs.	Deflection in.	Brinell center	Edge
1	Stationary	2600	31,900	4040	0.221	168	187
2	Stationary	2800	32,700	4045	0.225	180	188
3	Rocked 10 min.	2800	34,500	4310	0.241	182	185
4	Rocked constantly	3000	35,600	4540	0.249	189	189

HWG (12a)

Choosing Aluminum Fluxes. James Brinn. *Metal Industry,* N. Y., Vol. 31, Apr. 1933, page 129. The disadvantages of Zn chloride as a flux for Al are: introduction of Zn into the metal, sometimes prohibited by specifications; absorption of H_2O from the atmosphere; formation of gas and smoke. When melting clean metal cryolite or cryolite containing mixtures are advantageous. They do not introduce Zn into Al, remain dry when kept in open containers, form less smoke and gas than Zn chloride, but are not as effective in cleansing dirty Al. PRK (12a)

Investigation of the Dephosphorization of Iron by Oxidation (Untersuchung über die Entphosphorung von Eisen durch Oxydation). E. Diepschlag & H. Schuermann. *Angewandte Chemie,* Vol. 46, Jan. 21, 1933, pages 61-62. Several balances of material were made up to decide how P exists in the melt and in the iron. The reaction is represented by $2P + 8\ FeO = (FeO)_3P_2O_5 + 5\ Fe$. The Fe phosphate was found to be in the slag which contained in average 3.6% $(FeO)_3P_2O_5$ and 96.4% FeO, while the Fe showed about 0.75% P. Ha (12a)

Steel Deoxidation. *Foundry Trade Journal,* Vol. 48, Jan. 26, 1933, page 75. Value of Al in steels consists in its rapid reduction of oxides, ensuring sounder and denser ingots. It may be used in conjunction with other deoxidizers. The best methods of adding Al are summarized. One unit of Al is equivalent to 9 units of Mn, so far as deoxidation is concerned. OWE (12a)

An Investigation of Methods of Decarburizing Fe-Ni-Cr Alloys. R. W. Dayton. *Rensselaer Polytechnic Institute Bulletin* No. 41, Apr. 1933, 28 pages. Laboratory study on about 5 lb. melts of alloys of (a) 1.09% C, 0.62% Si, 0.57% Mn, 9.65% Cr, 60.50% Ni, balance (27.5%) Fe and (b) 1.21% C, 0.22% Si, 0.08% Mn, 16.88% Cr, 10.22% Ni, balance (71.3%) Fe in which FeO, Fe_2O_3, Cr_2O_3, NiO, etc. were added. Alloy (a) could be reduced at 1590°C. to 0.04% C. without appreciable loss of Cr, iron oxide being the most active, and the final oxygen content being about 0.05%. The slag must then be skimmed and the melt deoxidixed. Alloy (b) was not so readily decarburized. At 1610° C., using Cr_2O_3, carbon could be brought down to 0.09% with oxygen about 0.045%. It was calculated that at 1800° C. carbon could be dropped to 0.05%. Cr_2O_3 was more effective than FeO or NiO on alloy (b). Equilibrium constants were calculated. With iron oxide the constant for both alloys was $(0.66 \pm 0.06)(10^{-4})$, which is higher than the constant for pure iron. HWG (12a)

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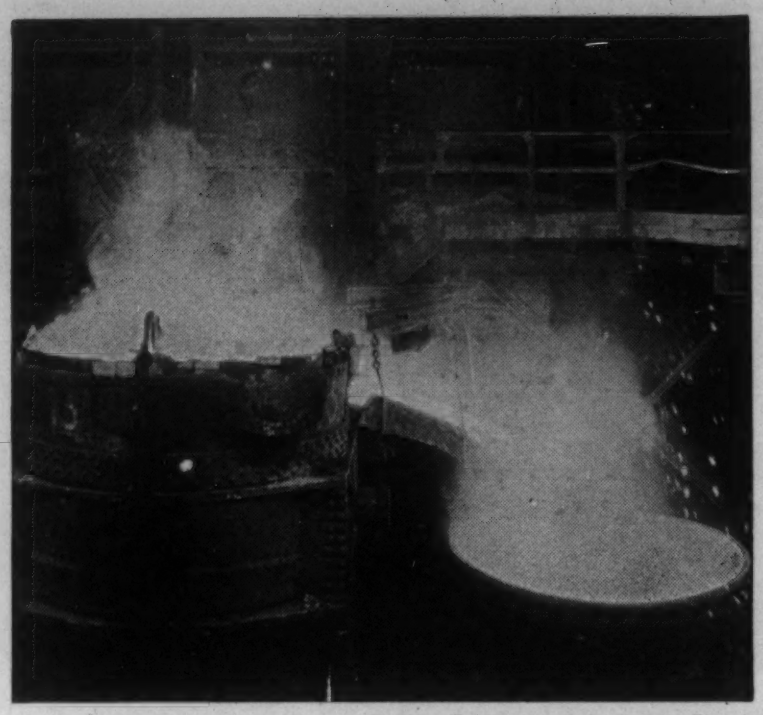

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Heat Contents of Metallurgical Reactions. (Wärmetönungen metallurgischer Reaktionen.) CARL SCHWARZ. *Archiv für Eisenhüttenwesen,* Vol. 6, Dec. 1932, pages 227-230. A summary is given in tabular form of heat content of 84 substances important in open-hearth operation. Ha (12a)

1 **Is Melting of High Quality Cast Iron in Electric Furnace Economical? (Ist das Erschmelzen von Qualitäts-Grauguss im Elektroofen wirtschaftlich?)** H. SIEGEL. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Mar. 19, 1933, pages 113-115. Calculations show that high test cast Fe can be produced economically in the electric furnace when Duplex method is used, i.e. when cupola melted Fe is refined in electric furnace. GN (12a)

Mass Effect and Quality in the Production of Basic Electric Steels. J. H. HRUSKA. *Fuels & Furnaces,* Vol. 10, Mar. 1932, pages 189-196. Effect of size of electric furnace on quality of steel produced and reaction ratio and speed of reaction as dependent on size of furnace are discussed and examples given. It can be concluded that larger electric furnaces will make possible more economic steel production in large quantities. Ha (12a)

2 **Soda Ash Improves Quality of Cast Iron.** *Mechanical World & Engineering Record,* Vol. 42, Dec. 9, 1932, pages 554-556. **Improving the Quality of Cast Iron with Soda Ash.** N. L. EVANS. *Machinery,* London, Vol. 41, Dec. 15, 1932, page 324. **The Desulphurisation and Refinement of Cast Iron.** *Engineering,* Vol. 135, Jan. 13, 1933, pages 59-60. Summary of a paper read by N. L. Evans at a joint meeting of the Council of the British Cast-Iron Research Association and the London branch of the Institute of British Foundrymen held on Dec. 1, 1932. Deals with the merits of sodium carbonate in desulphurizing, refining and degasifying cast iron. Kz + LFM (12a)

Bronzes Resistant to High Pressure. (Les Bronzes pour les Hautes Pressions.) M. SCHIED. *La Fonderie Belge,* Vol. 2, Mar. 1932, page 49. A summarized translation. See "The Melting of Bronze for High Pressure," *Metals & Alloys,* Vol. 3, Jan. 1932, page MA 18. FR (12a)

A Phase of Recent Research in Foundry Technique. Some Observations on the Use of Soda Ash. N. L. EVANS. *Foundry Trade Journal,* Vol. 47, Dec. 1, 1932, pages 331-337; *Iron & Coal Trades Review,* Vol. 125, Dec. 9, 1932, pages 884-886; Dec. 16, 1932, page 919. Soda ash process is becoming increasingly important in foundry work where it aids production of sound castings. Apparently soda ash primarily facilitates a separation of slag while preventing excessive removal of Mn. Effect on graphite and S is summarized. Questions of machining, use of malleable castings, shrinkage, and effect of soda ash on refractories are discussed. Ha + OWE (12a)

Remelting Type Metals. *Printing Equipment Engineer,* Vol. 44, July 1932, page 23. Arrangements and methods for the proper remelting and pigging of type metals are described. Kz (12a)

Electric Melting Gives Superior Iron. DELTON T. WABY. *Electrical World,* Vol. 101, Jan. 21, 1933, pages 100-103. Quality of cast iron produced by electric furnace will offset the cost of energy. The superior quality of electric iron is not yet appreciated in the market. A concise summary of foundries producing electric furnace cast iron includes capacity of transformer, primary voltage, furnace voltage, production capacity, composition of charge, type of castings produced, tons melted per year, Kw-hr per ton, major production problems, problems retarding more extensive use, and the advantages of the electric furnace. The potential business in this field is shown to be large. CBJ (12a)

5 **Exchange Ideas on Economy in Open-Hearth Practice.** *Steel,* Vol. 90, May 30, 1932, page 29. **Residual Chromium in Open-Hearth Charges Decreases.** *Steel,* Vol. 90, June 6, 1932, pages 31-32. Reports on the various topics under discussion at the 15th semi-annual meeting of the Open-Hearth Committee of the A. I. M. M. E., held in Pittsburgh, Pa., May 24-25. The first session was devoted to details of open-hearth practice and the second session to methods of controlling the chemical constituents of open-hearth heats. JN (12a)

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Rolling (12c)

New Continuous Sheet and Strip Mill of Otis Steel Company. *Rolling Mill Journal*, Vol. 7, No. 2, 1932, pages 93-95, 114. Describes 72" mill at Cleveland, O. MS (12c)

Modern Cold-Rolling Mills. *Metal Industry*, London, Vol. 41, Oct. 14, 1932, pages 365-368. Describes a few recent English installations: a cold-rolling mill with belt-drive, a 4-high mill for strip up to 40" wide, a reversing strip mill, a circular shear with feed drum and winding gear, and a strip straightening and cutting machine. These installations are for ferrous and non-ferrous metals. Ha (12c)

The Need for Standards of Surface and Finish on Rolls. *Machinery*, London, Vol. 41, Jan. 26, 1933, page 490. Since there are no generally recognized standards of "surface" and "finish" by which results can be gaged, difference of opinion exists to what constitutes a good surface, and elimination of this difficulty is urged. Kz (12c)

The Trend of Rolling-Mill Design. E. L. Williams. *Sheet Metal Industries*, Vol. 6, Dec. 1932, pages 477-480; Jan. 1933, pages 553-554. Paper before Sheffield Section of Institute of Metals. Traces the development of sheet production from the "battery" or stamping process to the present use of cluster mills. Discusses generally bearings, cambers, coilers, working speeds, and surface lubrication. AWM (12c)

Influence of Temperature and Foreign Metals on the Rolling of Zinc. (Einfluss von Temperatur und Fremdmetallen auf die Walzbarkeit von Zink.) O. Bauer & P. Zunker. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft XXI, 1933, pages 93-102. See *Metals & Alloys*, Vol. 4, May 1933, page MA 150. (12c)

A Survey of Roller-mill Bearings. W. H. Bowman. *Mechanical World & Engineering Record*, Vol. 91, Feb. 12, 1932, pages 152-153. In slabbing, blooming, and plate mills antifriction metal has been tried, reducing the power necessary to overcome friction by about 50%. AF metal should have a minimum content of 70% Sn, with a proportion of Sb and Cu. The construction, lubrication and cooling of bearings is discussed. Application of roller bearings is touched upon and savings in power consumption up to 55-60% are expected by these bearings when applied to mill necks. Kz (12c)

Some Aspects of the Manufacture of Chilled Iron Rolls. Archibald Allison. *Metallurgia*, Vol. 7, Apr. 1933, pages 181-184. General discussion of roll manufacture. Careful control at all stages is essential. Casting temperatures and chill-producing properties of the Fe are extremely important. The chill should be only deep enough to allow a reasonable amount of redressing. The rolls should be aged before using. JLG (12c)

Induction Heaters in Steel Rolling. *Electrical Review*, Vol. 111, Aug. 12, 1932, page 220. Brief description of a device invented by K. Younghusband. Heater consists essentially of Cu strips wound on edge with lower ends connected, and braced together and supported on 2 rods placed over but clear of the rolls, so that it can be used when the latter are revolving. Energy required is from 50-60 kw./hr. to raise temperature of a pair of 42" x 30" diam. rolls to 570° F. in 12 hr. MS (12c)

Improvements in Rolling Mill Design. Alfred F. Dixon. *Metallurgia*, Vol. 7, Mar. 1933, pages 151-154. General discussion. JLG (12c)

Most Efficient Roll Diameter. Pt. II. Albert B. De Salardi. *Rolling Mill Journal*, Vol. 7, No. 3, 1932, page 145. Develops equations for smooth rolls. MS (12c)

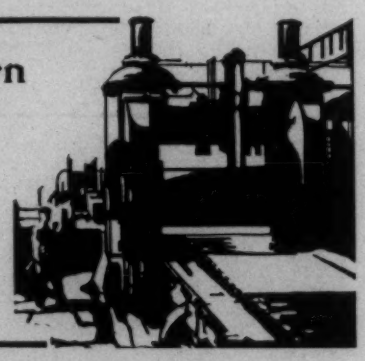
Electrical Equipment of the Blooming Mill of the Soc. An. Acciaierie Ferriere Lombardo Falck, Malan. (Elektrische Ausrüstung der Blockstrasse der Soc. An. Acciaierie e Ferriere Lombardo Falck, Mailand.) G. Zinkernagel. *AEG-Mitteilungen*, Dec. 1932, pages 368-373. Blooms of 4 tons are rolled from 550 x 550 to 100 x 100 mm. in a reversing mill of 7700 H.P. at 95 r.p.m., max. 24400 H.P. Maximum production is 75 t./hr. Motor is a double armature motor so that in case of accident the operation can be continued with reduced production. The motor is supplied by a fly-wheel set of 3 x 2160 kw. generators at 504 r.p.m., 650 volts, the fly-wheel weighs 50 t. A detailed description of the control equipment and oscillograms of the motor operation under reversals are given. Ha (12c)

Demonstrates New Principle of Rolling Hot Strip. *Steel*, Vol. 90, June 13, 1932, page 33. A description of the experimental application of a 4-high Steckel-type mill to the hot rolling of strip. JN (12c)

Keep Up With Modern Rolling Mill Practice

For cold rolling watch also Section 12j "Cold Working."

The Abstracts will help you



The Rolling Mill of the Future. C. E. Davies. *Metal Industry*, London, Vol. 42, Jan. 13, 1933, pages 59-64, 83-84. Present practice in rolling is reviewed with particular reference to English practice. Of the 2 breaking-down processes by hot and cold rolling the former is the most economical for Cu and its alloys. Cold rolling of ferrous materials requires that the reduction to finished gage should be accomplished in as few passes as possible and with intermediate annealing as infrequently as possible, the rolling speed should be as high as possible without increasing cost of production per ton of metal rolled. Reduction which can be effected in one pass and the factors influencing this, i.e. ability of the rolls to grip and rigidity of mill, roll bearings and driving power, different types of mills, two-high, three-and four-high and their particular field of employment, their advantages and disadvantages are discussed at length. The trend in cold rolling for any given tonnage output in sheet and strip is for fewer units than in older installations, consisting of the breaking-down-mill, 1 or 2 powerful four-high mills for wide strip and sheets, together with 3 or 4 high-speed two-high mills for narrow and moderate width strip. Ha (12c)

Rolling and Hot-Deforming of Cast Iron. (Ueber das Walzen und Warmverformen von Gusseisen.) Nipper. *Die Giesserei*, Vol. 19, Nov. 25, 1932, page 481. Reports on a new kind of cast iron consisting of a ferritic or pearlitic or otherwise heat-treated base material with embedded, very well orientated lines of graphite or ledeburite. Plates made of such material and their properties and possible application are described. Ha (12c)

Controlling Operation of Steckel Mills. F. Mohler. *Iron Age*, Vol. 130, Nov. 17, 1932, pages 756-757, 793. Describes chiefly electrical equipment used in operation of mill. Outstanding requirements of equipment are smoothness of operation, ease of manipulation and simplicity. Desirable arrangement is so that acceleration may be stopped at any speed for gaging or inspection. The only satisfactory control under these conditions is the so-called adjustable potential type. VSP (12c)

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Machining (12g)

Physical Properties of High Melting Compounds. (Die physikalische Eigenschaften hochschmelzender Verbindungen.) KARL BECKER. *Physikalische Zeitschrift*, Vol. 34, Mar. 1, 1933, pages 185-198. Preparation of pulverulent carbides, nitrides and borides. Structure, density, hardness, tensile strength, melting point, thermal coefficient of expansion, electrical conductivity, electronic emission and magnetic and optical properties of TiC, ZrC, TaC, NbC, TiN, ZrN, TiB, ZrB. Physical properties of alloys of tungsten carbide with Co, including hardness, density, mechanical, electrical, magnetic, and thermal properties. Physical properties of alloys of tantalum carbide with members of the iron group. Bibliography of 99 items. RRS (12g)

Cutting Lubricants and Soluble Oils. H. N. BASSETT. *Mechanical World & Engineering Record*, Vol. 91, Mar. 18, 1932, pages 276-277. Critical discussion of the way in which the different cutting fluids operate in saving tool wear and increasing production. Dealing with the various kinds of oils, water solutions, and emulsions, the properties of these materials with regard to their use as cutting lubricants are outlined. To eliminate skin diseases the use of antiseptics in cutting oils and soluble oils are recommended. Kz (12g)

Useful Hints on Drilling Metals. H. BENTLEY. *Metal Industry*, London, Vol. 41, Dec. 30, 1932, page 642. Suggestions are given for drilling large numbers of holes in hard and soft non-ferrous metals with high-speed twist drills, for drilling ebonite, bakelite, rubber and how to extract broken screws, pins, etc. Ha (12g)

The Twist Drill and Machinability in Drilling Cast Steel. (Spiralbohrer und Zerspanbarkeit beim Bohren von Stahlguss.) HEINRICH BEUTEL. Doctor's Dissertation, Aachen, 1931, 18 pages, 11 references. The Dissertation also contains a reprint. **The Machinability of Cast Steels in the Drilling Process. (Die Zerspanbarkeit des Stahlgusses im Bohrvorgang.)** A. WALLICHS & H. BEUTEL. *Die Giesserei*, Vol. 19, 1932, pages 241-247. This reprint is a briefer report of the same research. The first part of the work related to experimental procedure such as shape of drill, feed, depth of holes, etc. The details are given. Tests were made on a variety of cast steels ranging in tensile strength from 54,000 to 85,000 lbs./in.^{2}. The variables studied with reference to their effect on machinability included, chemical composition (C, Si, P, S, Ni and Ni plus Cr), strength, hardness, heat treatment, lubricating and cooling agents. The results are reported largely in graphs which do not lend themselves to reproduction in an abstract. Some comparisons are made of the results of this research with the results of lathe tests on the same material as previously reported by Wallichs and Krekeler [*Die Giesserei*, Vol. 17, 1930, pages 325-329 and *Foundry Trade Journal* (London) Vol. 44, 1931, pages 165-166.] OEH (12g)

Using Super-Hard Tools for Planer Work. *Machinery*, Vol. 38, May 1932, page 670. General discussion on planer design and planer speeds for use with cemented carbide tools. RHP (12g)

Remarkable Results Obtained with Tungsten-Carbide Broaches. *Machinery*, London, Vol. 40, May 12, 1932, page 168. After having been used for different kinds of tools, experiments with tungsten-carbide for broaches have shown superiority of this alloy. A tungsten-carbide broach gave 10 times efficiency of an ordinary high-speed steel broach. Kz (12g)

Molybdenum-Titanium-Carbide Cutting Tools. *Machinery*, London, Vol. 40, June 23, 1932, pages 355-357. The Quality Steels, Ltd., 70 Pall Mall, London, S.W. 1 offers an alloy "Cutanit" made up of carbides of Mo and Ti. As regards physical properties, "Cutanit" has a Rockwell hardness of 83-85 on the 100 kg. scale and a specific gravity of 6.5. It resists oxidation at temperatures up to 900° C. and possesses good heat conductivity. Cutting qualities and speed are discussed and compared with those of tungsten-carbide. Results of experimental tests are given, tables and a chart showing efficiency curves for Mo-Ti-carbide and high-speed steel tools accompany the article. Kz (12g)

Tungsten-Carbide Broach Produces Over a Million Pieces. *Machinery*, Vol. 38, May 1932, page 695. A broach for automobile valve guides with tungsten carbide cutting tips has a life of over 1,000,000 pieces. Life between grinds 350,000 to 400,000 pieces. The life of high speed steel for the same operation was 35,000 to 40,000 pieces between grinds. RHP (12g)

Cemented-carbide Tools and Machine Design. *Machinery*, London, Vol. 41, Mar. 16, 1933, pages 693-706. **The Effect of Cemented-carbide Tools on Manufacturing Practice.** *Machinery*, London, Vol. 41, Mar. 16, 1933, pages 707-713. The employment of cemented-carbide tools, effecting higher cutting speeds, and giving a finer natural finish direct from the tool due to the high cutting speed and fine feed called for new and improved machine designs which are comprehensively dealt with. Kz (12g)

Have You a Machining Problem?

The answer may be here.

The Effect of Density on the Machinability of Steel Forgings. *Machinery*, London, Vol. 40, Sept. 8, 1932, page 710. Two possibilities of increasing density of steel forgings are referred to: (1) coarsening structure before heating (2) several annealing operations. An improvement in machinability of from 50 to 400% and an increase in durability of from 11 to 60% are claimed as a result of greater density. Kz (12g)

A 100-Horsepower Lathe for Testing the New Cutting Alloys. *Machinery*, Vol. 38, Apr. 1932, pages 620-621. American Tool Works Co., Cincinnati, Ohio has designed a lathe of 100 h.p. input, 140 spindle speeds from 33-1200 r.p.m., weight 40,000 lbs. Describes and illustrates this machine which is used for testing cutting capacities of cemented carbide cutting tools. RHP (12g)

The Machine Tool Industry and the New Cutting Tools. *Machinery*, Vol. 38, May 1932, pages 690-693. Review of opinions of a number of machine tool builders. New cutting tools have in many cases required more power, higher speeds and greater rigidity of machines and machines have been designed to satisfy these requirements. RHP (12g)

Wider Use of Water-Mixed Cutting Oils Would Reduce Production Costs. V. W. WELLS. *Automotive Industries*, Vol. 68, June 17, 1933, pages 727, 734. A recent survey of cutting oil practice in a number of large plants reveals the fact that water-mixed cutting oils are used on only about 1/3 of the machining operations. The cost of the cutting oil used seldom represents more than 3% of the total cost of machining and therefore it would not be economical to sacrifice cutting speeds, production rates or finish in order to use a cheaper cutting oil. On light, high-speed operations where the chief purpose of the cutting oil is to keep the work cool, water mixtures can be substituted for straight cutting oils. In these cases the water mixtures not only cut the costs but enable the operator to increase the cutting speed. The writer is citing strict advantages. DTR (12g)

Drawing & Stamping (12h)

Power and Hand Press Production. Methods of Application, Tool Design, and Construction. R. WAKE. *Mechanical World & Engineering Record,* Vol. 91, Mar. 11, 1932, pages 248-251. Successful deep-drawn presswork depends on a number of factors. Material must be of a suitable composition and structure, and must conform to definite limits of thickness. A steel suitable for deep-drawing should have the following properties: ultimate strength = 22 tons/in.^{2}, yield point = 14 tons/in.^{2}, elongation = 41%. Lubrication of the metal during drawing is necessary, and the use of pickled bright sheets gives the best results. The analysis of sheet steel for average press-shop cold deep-drawing is given as: 0.09% C, 0.05% Mn, 0.04% S, 0.05% P. Advantages of cold-forming and pressing are compared with hot-pressing. After discussion of the design of tools and rate fixing, the die material is dealt with suggesting good gray cast iron for complicated dies, air-hardening Co-steel castings for long life, iron faced with steel for shallow dies. Heat treatment of dies is touched upon and different types of dies are discussed. Kz (12h)

Deep Drawing of Rustless Steels. M. H. SOMMER. *Iron Age,* Vol. 130, Nov. 10, 1932, pages 726-727, adv. sec. page 14; *Sheet Metal Industries,* Vol. 6, Jan. 1933, pages 583-585. Discussion of many factors involved in deep drawing of this type of steel. Calculation of reductions is covered in some detail. Formulae are given for determination of diameter to which various materials may be drawn in one operation from a given diameter. A graphical solution is shown for the same purpose. VSP + AWM (12h)

Tests of Thin Strips For Deep Drawing. H. T. MORTON & I. A. RUMMLER. *Iron Age,* Vol. 129, Jan. 28, 1932, page 291. Abstract of paper read before American Society for Steel Treating at Boston. See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 306. VSP (12h)

Specialized Deep Drawing in Zinc Making a 6-in. Dry Cell Battery Can. E. H. ARNOLD. *Iron Age,* Vol. 129, Apr. 28, 1932, page 971, adv. sec. pages 24, 26. Most important part of work is the determination of the number of operations needed. Each operation is important because the reduction during each drawing operation has to be in such proportion and reduction so distributed that each reduction can be made from the first draw to last redraw without exceeding limits metal would stand without being stretched or fractured. Series of operation, 6 in number, consist of a draw, then 5 redraws and a trimming operation which is combined with final redrawing operation. VSP (12h)

Carbon Steel Die Blocks for Drop Stamping. *Machinery,* London, Vol. 41, Jan. 12, 1933, page 429. Analysis of steel and characteristics of ingots used for blocks are given. Treatment of die blocks before and after sinking impression is discussed. Kz (12h)

Drawing and Bulging Horn-Shaped Shells from Flat Sheets. F. C. DUSTON. *Machinery,* Vol. 38, Apr. 1932, pages 604-605. Discussion of methods in use for forming parts. Equipment used was developed by U. S. Tool Company, Inc., Ampere, N. J. RHP (12h)

Commercial Types of Power Presses. Pt. XII. Coil Stock for Automatic Feeding. E. V. CRANE. *Metal Stampings,* Vol. 5, Jan. 1932, pages 21-24, 37-38. Outlines recent developments in rolling of metal in coils. These have an important bearing upon the rapid expansion of the practice of automatically feeding power-presses. Increased gages, widths and lengths of coils have necessitated new types of coil stands and feeds. Job requirements control the temper of stock to be specified. Presents curves showing the plastic cycle which brass may have to traverse during fabrication and the relation of the temper designations for brass and Al to reductions in cold working and to physical properties. Directional properties of strain hardened metal must often be considered in lay-outs for automatic coil-stock operations. MS (12h)

Die For Deep Drawing of Shells. RICHARD DALE. *Iron Age,* Vol. 130, Aug. 11, 1932, page 213, adv. sec. page 20. Illustrates and describes a deep drawing die which is one of most efficient and gives least trouble of any die used for this purpose. VSP (12h)

Durability of Stamping Dies. (Die Lebensdauer der Prägestanzen.) *Deutsche Goldschmiedezeitung,* Vol. 36, Mar. 25, 1933, pages 133-134. Discussion of points to be borne in mind in heat treating stamping dies. GN (12h)

The Deep-drawing Qualities of Thin Sheets. J. CUNNINGHAM. *Mechanical World & Engineering Record,* Vol. 92, July 15, 1932, pages 53-54. In a deep-drawing expansion test annular test pieces having a central hole are drawn into a cup while the outer rim of the cup is firmly clamped in a circular flat-faced die, the material being drawn radially from the center, and the central hole enlarging until cracks appear round the inner edge. The percentage expansion of this hole and the load required to produce the deformation are measured. These results are claimed to give a better indication of the ability of the material to undergo deep-drawing than the Erichsen test and are compared with those provided by the Erichsen test. The deep-drawing expansion test has been valuable in correlating useful deep-drawing properties to microstructure, cold-working, and heat treatment. Kz (12h)

Studies of the Wire Drawing Process. III. Lubrication. EDGAR L. FRANCIS. *Iron & Steel Institute, Carnegie Scholarship Memoirs,* Vol. 21, 1932, pages 1-34. Points out importance of lubrication in drawing as it affects power expended and flow of metal. Two types of lubrication, "fluid" and "boundary" are discussed. Boundary lubrication is that which occurs in wire drawing and under such condition friction is proportional to coefficient of friction and pressure. Only important property of oil which enters is that called "oiliness" which is really not a property of oil *per se* but of oil-metal interface. Work is cited showing that in a given homologous series the higher the molecular weight the better the oiliness and that the OH group of carboxyl acid group is more effective than that of alcohols. Saturated compounds are more effective than unsaturated and symmetric than asymmetric. Author presents results of testing various lubricants in a friction testing machine and by measuring power required to draw using lubricant. Results indicate that lubrication under wire drawing condition is of "boundary" nature, film of lubricant is 10^{-5}" thick. Viscosity, pressure or speed of relative motion are without influence but is affected by amount of free fatty acids present. Animal and vegetable oils which contain free fatty acid are satisfactory but mineral oils are without lubricating effect under these conditions. WLC (12h)

Fabricating Ford Lamps From Rustless Steel. BURNHAM FINNEY. *Iron Age,* Vol. 130, Aug. 11, 1932, page 214-217, adv. sec. page 20. Experience in fabricating lamps has proved that rustless steel can be used with only a slight additional cost compared with C steel. Most spectacular operation is stamping of head lamp shells from 0.025" gage rustless steel on an automatic progressive press which performs 8 operations: Oiling the stock, first and second draw, trim, final draw and forming the flange in 4 successive dies. Entire operation is automatic. VSP (12h)

Corrugating Steel Ends for Freight Cars. E. J. TANGERMAN. *American Machinist,* Vol. 76, Oct. 26, 1932, pages 1089-1091. Describes equipment for corrugating by hot-pressing 6 × 8 ft., ¼" thick plates. 20 to 25 tons of material are handled per hr. by a 5-man crew. Ha (12h)

Energy Requirements and Motor Selection for Power Presses. Pt. I-II. W. M. EVARTS. *Metal Stampings,* Vol. 5, Jan. 1932, pages 15-18-38; Feb. 1932, pages 121-124, 138. Deals with capacities of presses and with calculation of energy requirements for shearing, drawing, forging and sizing, embossing and coining, stamping, and extruding. MS (12h)

Adjustable Forming Die. JOHN W. GERDEL. *American Machinist,* Vol. 77, Feb. 15, 1933, pages 118-119. Construction and operation of a special die forming rectangular pans up to 20" square including wire-rolling the edges is described. Ha (12h)

Avoidance of Cracks in Drawing Work Pieces. (Was macht man, wenn die Werkstücke beim Ziehen reissen?) *Deutsche Goldschmiedezeitung,* Vol. 36, Jan. 28, 1933, pages 51-52. Practical hints are given to avoid failures which occurred in processing rings of German silver with U-shaped cross-section. GN (12h)

Lime in Wire Drawing. D. E. WASHBURN. *Wire & Wire Products,* Vol. 7, Nov. 1932, pages 385-386. Requirements for a lime to be used successfully in drawing operations are discussed; quick lime is generally employed, and hydrated lime at times. Ha (12h)

Sheet and Strip Steel for Stampings. EDWARD S. LAWRENCE. *Iron Age,* Vol. 128, Dec. 31, 1931, page 1690; *Sheet Metal Industries,* Vol. 5, Mar. 1932, pages 749-752; Apr. 1932, pages 813-816. Abstract of paper read before the American Society for Steel Treating. See "Comparison of Sheet and Strip Steels for Difficult Stampings," *Metals & Alloys,* Vol. 3, May 1932, page MA 138. AWM + VSP (12h)

Pickling (12i)

Iron and Metal Pickling. (Praxis der Eisen- und Metallbeizerei). OTTO VOGEL. *Oberflächentechnik,* Vol. 10, Jan. 3, 1933, pages 1-3. Great importance of proper pickling methods for obtaining metallically pure surface is pointed out as this greatly influences further treatment be it mechanical (drawing, rolling, etc.) or chemical (plating). Reactions of the usually employed pickling acids, HCl, H_2SO_4, HNO_3, HF and H_3PO_4 are explained and a few general directions are given for handling and diluting of acids. Particular care must be taken that used pickling fluid is neutralized properly before being allowed to flow away; this is best done by passing it first through a tank with lime, then into a settling tank from which now harmless liquid can run out. Workmen must be protected against dangerous vapors which are generated by acid attacking metal itself. This is prevented by certain additions (often patented) to pickling bath. Arrangements for convenient handling of material to be pickled are described. Ha (12i)

Pickling of Stainless Steels. (Le decapage des aciers inoxydables.) J. PONY. *Revue du Nickel,* Vol. 3, July 1932, pages 101-104. Describes methods and formulas of solutions for pickling of stainless steels. AH (12i)

Pickling Baths for Nickel and Nickel Alloys. (Beizen für Nickel und Nickel-legierungen.) H. KRAUSE. *Apparatebau,* Vol. 44, Nov. 11, 1932, pages 155-156. Discusses pickling solutions for German silver. The following 3 are given for the subsequent stages of pickling: (1) 3 l. conc. H_2SO_4 in 10 l. H_2O, to be used at 25°-30° C., (2) HNO_3 plus 5 g. HCl/l. + a bit of soot, (3) 3 l. conc. HNO_3 + 5 l. H_2SO_4 + 50 g. NaCl + soot. Careful degreasing before pickling is stressed. For pickling Ni specifications of German Non-ferrous Materials Handbook and for pickling Monel metal those of the International Nickel Co., are suggested. GN (12i)

Automatic Pickling Machines. H. R. SMALLMAN. *Better Enameling,* Vol. 3, June 1932, pages 9-12, 36. Design features and operation of automatic pickling machines are discussed. CBJ (12i)

Pickling of Iron and Steel. The Function of Nascent Hydrogen. W. J. IMHOFF. *Iron & Coal Trades Review,* Vol. 125, Oct. 28, 1932, pages 656-657. Discusses danger of handling many of the inhibitors. Mechanism of inhibitors in pickling process as reducing development of poisonous gases is explained. Action is ascribed to nascent H which at the moment of its formation is more chemically active than ordinary H due to its atomic state. Chemical reactions going on between Fe and pickling solution are described; acid must be ionized if pickling is to be effected. Double role H can assume as an acid in some compounds and not in others according to nature of solvent is explained and amount of ionization in HCl, H_2SO_4 and acetic acid given. Ha (12i)

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Cleaning (12k)

Special Sandblasting Apparatus for Cleaning of Steel Rings. (Sondersandstrahlgebläse zum Reinigen von Stahlringen.) *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Sept. 24, 1932, page 946. Constructive details are given of a sandblasting machine for cleaning a great number of similar articles, for instance, wheels of automobiles. Ha (12k)

Removal of Corrosion Products from Iron. THOMAS J. FINNEGAN & RICHARD C. COREY. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 5, Mar. 15, 1933, pages 89-90. Corrosion products can be removed from Fe wire specimens by means of H_2SO_4 and inhibitor, ammonium citrate, and NaOH and Zn, all 3 methods giving efficient removal of deposit. Use of NaOH and Zn according to method of Chaussain and Cournot is preferable, as it does not attack bare Fe. Brushing as a means of removing deposit from small samples is worthless. MEH (12k)

Bullard-Dunn Process. (Das Bullard-Dunn-Verfahren.) *Oberflächentechnik*, Vol. 10, Jan. 17, 1933, pages 20-21. Electrolytic cleaning method for Fe and steel by which H-gas is formed between base material and impurities on it (rust, scale, oxides, etc.) so that the latter are broken up and removed. As soon as the base material is clean a microscopically thin protective metal layer of Pb or Sn is immediately deposited electrolytically which adheres firmly and tightly to base material and protects it against any further pickling action. Any further H-formation leads only to spongy deposits on protective layer. Not only metal crystals but also intercrystalline structure of metal is protected by layer and prevents corrosion and erosion absorption of H, so that often dreaded pickling-brittleness which is due to absorbed H is avoided. Process is said to produce perfectly clean metal surface for galvanizing and plating and to increase life of high-grade gears, etc.; it further makes visible at once, small cracks due to forging or hardening and reduces grinding work. Ha (12k)

Scale Removal in Sheet Rolling. *Iron & Coal Trades Review*, Vol. 126, Jan. 13, 1933, page 48. Description of a cleaning machine by Thomas & Davies, Cardiff, England. Scale is first broken down by water spray and then removed by passing bars under steel scrapers and brushes, first on one side, then on other. Ha (12k)

The Heat-Treatment of Metals. After-Cleaning Baths in Non-Ferrous Practice. *Chemical Trade Journal & Chemical Engineer*, Vol. 91, July 8, 1932, page 33. In cleaning heat-treated metal parts made of non-ferrous metals such as Cu, brass, bronze, Al, Ni, etc., the use of weaker acid solutions with longer immersion periods is recommended for preserving fineness of surface and integrity of dimensions of treated parts; as well as for reducing acid consumption. Formulae are given for preparing solutions used for cleaning and brightening the various types of metals. JN (12k)

Metal Cleaning Methods and Materials. JOSEPH GESCHELIN. *Automotive Industries*, Vol. 68, Apr. 15, 1933, pages 466-470; Apr. 29, 1933, pages 522-526; June 10, 1933, pages 702-703. In part 1 writer simplifies subject by clarifying different factors that control metal cleaning. Available materials and methods are enumerated and form basis for entire discussion of subject. They are as follows: alkaline preparations, pickling, degreasing, eletrolytic methods, electrolytic bright dip, Bullard-Dunn process, cleaning tanks and rinses both hand and mechanical, metal washing machines. Each of above methods are taken up individually. Writer contends that a judicious selection of materials and methods will be reflected in quality of work and in a reduction of overall cleaning costs. Special advantages of electrolytic methods are cited. Details on general applications of materials and processes now on market are also discussed. In part 2, special features of some of these products and processes are treated. It is possible thus far in this article to analyze metal cleaning problem, select right type of materials and method, and also select proper kind of equipment. In part 3, several new proprietary cleaning materials are mentioned, as well as the mechanism of cleaning with alkaline preparations. New materials are Udylite No. 7 and No. 11, and Ex-Cel-O. The free-rinsing properties of alkaline cleaners are emphasized. Good rinsing is as important as good detergent action, for although the latter softens, loosens adhering dirt, the rinse is depended upon for the completion of its removal. On the whole the paper is valuable only to the operator. DTR (12k)

Modern Degreasing and Cleaning. (Neuzeitliches Entfetten und Reinigen.) FIRGAU. *Oberflächentechnik*, Vol. 10, Jan. 3, 1933, pages 3-5. Best means for efficient cleaning of metallic surfaces has not yet been developed; important factors are (1) cleaning power, (2) economy, (3) safety of operation. Organic and inorganic cleaning agents are discussed from these points of view; benzine, benzol, trichlorethylene belong to first group of which first 2 develop dangerous effects on operators. Although organic materials are good solvents for fats, oils, tar, etc. they are too volatile, explosive and poisonous. Inorganic agents are usually caustic soda and silicic and phosphoric alkali salts of which the 2 latter are preferable as they do not attack the metal. Cleaning bath ought to be stirred continually. Arrangements are briefly described. Ha (12k)

Degreasing and Cleaning (Vapour Cleaning). W. F. JESSON. *Metallurgia*, Vol. 7, Dec. 1932, pages 37-38. Recommends use of trichlorethylene, and points out some of its advantages. JLG (12k)

Degreasing of Metallic Articles. (Entfettung von Metallgegenständen.) H. KRAUSE. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle*, Vol. 6, May/June, 1932, pages 13-19. 3 methods of removing fat and grease by solvents of fats, boiling and brushing with alkalies and electrolytic treatment are discussed and their application described. Recipes are given. Ha (12k)

Preparation of Zinc and Zinc-Alloy Surfaces for Coating. H. A. NELSON & W. W. KITTELBERGER. *Industrial & Engineering Chemistry*, Vol. 25, Jan. 1933, pages 27-32. Discussion covers various types of Zn-coated steel, Zn sheet, Zn-alloy sheet, Zn-alloy die castings, etc. Service requirements considered range from structural surfaces to hardware and furnishings. Conditions under which surface treatments may be desirable or necessary are discussed. Treatments that have been used include; cleansing with solvent washes, mechanical etching, chemical etching, formation of adherent deposits and weathering. Each of these may be applied in various ways. Tests have shown that some of proposed schemes are not at all effective, and that others are very effective. Nature of surface left by treatment and its aging effects on the coatings are considered as factors in results on different metal bases. MEH (12k)

Cleaning and Preparing Castings for Dry Process Enameling. *Better Enameling*, Vol. 3, Feb. 1932, pages 14-17. Equipment required for cleaning and preparing castings for enameling includes: hoists and trucks for handling and transporting castings, vibrating machines, tumbling mills, welding equipment, grinding equipment, sand blast equipment and miscellaneous tools. Plant arrangement is outlined. CBJ (12k)

The Preparation of Metals for Electroplating. *Metal Industry*, N. Y., Vol. 30, Sept. 1932, pages 359-360; Oct. 1932, pages 400-401; Nov. 1932, pages 440-441. Article prepared by technical staff of E. F. Houghton Co. Depending on type of dirt to be removed, emulsification, requiring soaps, and saponification, requiring alkalies, or both are used. Type of alkali used depends upon metal to be cleaned. Proper type of controlled alkali will not cause slightest degree of tarnish on pure Al. Absence of oil, grease or fat is determined by water break test, made by immersing work in cold water, lifting from water without shaking, holding in a vertical or 45° angle plane and observing film of water as it drains. A break means a dirty surface and may be deceiving if rinse be contaminated with soap. Test has no value in determining presence of oxides, carbon smut, or inert matter. Methods of removing these latter forms of dirt are given. The 3rd part gives a complete schedule of operations involved in cleaning ferrous and non-ferrous metals of all kinds before acid or alkali plating. PRK (12k)

Polishing & Grinding (121)

Investigation of Geometric and Physical Conditions of Polished Surfaces. (Untersuchungen über den geometrischen und physikalischen Zustand politierter Oberflächen.) GERHARD SCHMERWITZ. *Physikalische Zeitschrift*, Vol. 34, Feb. 15, 1933, pages 145-158. Describes method for determining unevenness in polished surfaces of wires and balls. Claim that even best polished wire does not present a truly circular cross section was verified. Linear deviations, however, were so small that they could not be shown by means of any apparatus previously used. Unevenness due to polishing is shown clearly in tests on steel ball bearings and glass balls. RRS (121)

Practical Grinding Materials and Grinding Machines. (Praktische Schleifmittel und Schleifmaschinen.) H. KALPERS. *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Mar. 5, 1933, pages 89-93. After briefly discussing natural and artificial materials used for grinding metals, a large number of modern grinding machines for various purposes and widely differing in construction are described and shown. GN (121)

Sharp Corner Grinding. W. WELLS. *American Machinist*, Vol. 77, Feb. 1, 1933, page 86. Suggestions and recommendations are made and illustrated for conveniently grinding a sharp corner. Ha (121)

The Theory and Practice of Roll Grinding. H. J. WILLS. 48 page booklet published by The Carborundum Co. Size 5x7 in. Covers surface finish requirements, difficulties arising from the equipment used in roll grinding and factors affecting grinding. Specific instructions are given for grinding various kinds of rolls for different uses. RR (121)

Polishing of Aluminum Cooking Utensils. (Das Polieren von Aluminium-Kochgeschirr.) *Aluminium*, Vol. 14, Sept. 15, 1932, pages 2-4. The polishing methods of cast Al cooking utensils are described in detail. Ha (121)

Honing Finishes Big End Bores Within 0.0003 in. A. F. DENHAM. *Automotive Industries*, Vol. 68, Apr. 8, 1933, pages 438, 449. Honing is now being adapted on an extensive scale to the finishing of connecting rod lower end bores. This new method is being used by both Ford and Plymouth in regular rod production. In the case of Ford rods, where several parts are finished simultaneously, the hone is now piloted while the work is floated, instead of trying to maintain a rigid mounting for each of the parts to be finished. DTR (121)

A Block in 51 Seconds. KIRKE W. CONNOR. *Automotive Industries*, Vol. 68, Feb. 18, 1933, pages 201-202. Accuracy of honed cylinders has been improved by means of a micromatic mirror finish. New process consists of a combination of roughing and finishing operations yielding a production of over 70 cylinder blocks per hour. Bores are held within limits of under 0.0003″ for roundness and 0.0005″ for total taper. It has been about 7 years since honing process replaced internal grinding of cylinder bores, using manually adjusted brake-type honing tools. New mirror-like finish is effected by use of a secondary honing operation in which from 0.0007 to 0.001″ stock is removed in order to entirely eliminate previous honing scratches. DTR (121)

The Grinding of Hard-Metal Tools. R. SIMON. *Engineering Progress*, Vol. 13, Mar. 1932, page 60. Grind plane surfaces on a disk wheel. Wet grinding is preferable. Dry grinding may be suitable for tools of small cross-section. Wheel should be accurately round, running without vibration, of hard grain such as silicon carbide, but with a soft bond. Light pressure should be used. RHP (121)

Nature of the Polishing and Grinding Processes. (Zur Kenntnis des Schleif- und Polier-Vorganges.) L. HAMBURGER. *Zeitschrift für Metallkunde*, Vol. 25, Mar. 1933, pages 29-32, 58-61. Critical review, with an extensive bibliography. RFM (121)

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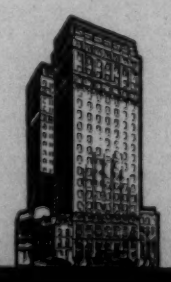

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DEFECTS (13)

Inclusions—Their Effect, Solubility and Control in Cast Steel. C. E. Sims & G. A. Lillieqvist. *Foundry Trade Journal*, Vol. 47, Aug. 11, 1932, pages 77-82. Technical Publication No. 453 of the American Institute of Mining and Metallurgical Engineers. See *Metals & Alloys*, Vol. 3, Aug. 1932, page MA 253. OWE (13)

Causes of Spoiled Silumin Castings. (Ausschussursachen bei Silumin.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Apr. 16, 1933, pages 161-162. Such causes are superheating of melt, improper melting and refining procedure. Since refining is of decisive importance for obtaining sound castings this method is discussed at length. Melting and casting temperature control are stressed. GN (13)

Is Quenched and Tempered Steel Unstable? Ernest E. Thum. *Metal Progress*, Vol. 22, Aug. 1932, pages 30-34, 62. Evidence indicates that failure of heat treated, basic steel wire employed in Mount Hope and Detroit River bridges cannot be explained on basis of impermanence of properties imparted by heat treatment. Extensive work at Bureau of Standards shows that microstructure is predominantly and uniformly troostite and does not reveal any characteristics to arouse suspicion of changes subsequent to manufacture. Physical tests made on wire taken from dismantled structure lead to same conclusion as these tests show results agreeing very closely with those specified for this type of work. WLC (13)

New Type of Inclusion Depends on Manganese-Silicon Ratio. F. J. Cook. *Foundry*, Vol. 60, Feb. 1932, pages 44-46. Abstract of paper read at Chicago Meeting of American Foundrymen's Association. See *Metals & Alloys*, Vol. 2, Nov. 1931, page 274. VSP (13)

Principal Causes of Porous Brass Castings. (Die Hauptursachen von porösem Messingguss.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Feb. 5, 1933, pages 53-54. Discusses various causes of porosity in brass castings and distinguishes following 3 types: (1) porosity as observed in the pressure test, (2) fine pores which are found as small black spots upon polishing, (3) blowholes below the casting skin as revealed upon machining. The remedies are described. GN (13)

Some Factors Affecting the Soundness of Bronze Castings. E. J. L. Howard. *Foundry Trade Journal*, Vol. 48, May 4, 1933, pages 317-321. There are 2 general causes of unsoundness: evolution of gases during solidification, and shrinkage. Shrinkage is discussed briefly, the emphasis being placed on the desirability of a narrow freezing range. If the latter is attained as well as possible, improper design will remain as the chief cause of porosity. The mechanism of the solution of gases (especially H and SO_2) in molten metals and their subsequent evolution is sketched, and the effect of dissolved oxides illustrated by photomicrographs. The best melting practice, casting temperature, and methods of running are briefly noted. Impurities (from the sand, etc.) provide further, though avoidable, sources of unsoundness. OWE (13)

Scrap and Production Troubles as a Result of Different Forms of Pearlite in Decarburized Tool Steel. V. Ya. Skotnikov & Y. N. Spiridonov. *Vestnik Metallopromishlennosti*, Vol. 12, Feb. 1932, pages 87-89. (In Russian.) In machining round bars of 1.15% C steel much trouble was encountered due to the difficulty in cutting. It was caused by a superficial layer of decarburized metal 1-2 mm. thick. In cutting of files the intermediate zone between ferrite on the outside and spheroidized cementite in the core composed of lamellar pearlite produced microscopic cracks which opened badly on quenching. Care should be taken to prevent decarburization in spheroidizing. (13)

Breakage of Helical Springs. (Sulle rotture delle molle ad elica.) A. Oreffice. *La Metallurgia Italiana*, Vol. 24, Aug. 1932, pages 643-645. Review of principal causes of breakage of helical springs. Failures due to: defective materials, exceeding critical velocity of synchronism, and exceeding elastic limit, are discussed. Formulas of Simmon for velocity of synchronism, and of Wahl for the elastic limit are explained. AWC (13)

How Riveted Boiler Seams can and do Deteriorate. J. P. Morrison. *Locomotive*, Vol. 39, Oct. 1932, pages 107-115, 119-122. Nature of fire cracks, lap seam cracks and caustic embrittlement is explained and several examples given to show how they develop and how they can be eliminated or minimized by proper treatment and operation. Ha (13)

Axle Fractures in Railroad Vehicles and Their Causes. (Achsbrüche bei Eisenbahnfahrzeugen und ihre Ursachen.) Reinhold Kühnel. *Stahl und Eisen*, Vol. 52, Oct. 6, 1932, pages 965-969. Based on results of Deutschen Reichsbahn-Gesellschaft a survey of different kinds of axle fractures in locomotives, passenger and freight trains is given. Peculiarity of formation of fracture facilitates future recognition of causes of such fracture and an investigation of materials may be disregarded. Wedge groove and boss fractures owe their origin generally to unusual stressed conditions. MGL (13)

Cracking of Welded Tubes of a Water Tube Boiler. (Aufreissen geschweisster Rohre eines älteren Wasserrohrkessels.) Krüger. *Die Wärme*, Vol. 55, July 2, 1932, page 470. Micro-structural investigation on the boiler tubes, which failed in service, revealed that they had an over-lap welded joint prohibited in Germany since 1926. In addition to this, the seam proved to be rather poorly made and contained an appreciable amount of slag and oxide inclusions. EF (13)

Reclaiming Leaky Castings. W. M. Corse. *Metals & Alloys*, Vol. 3, Nov. 1932, pages 255-256. The author describes a method of reclaiming pressure castings that would otherwise be rejected as "weeps" or "sweats" by forcing through the pores a solution of phenyl formaldehyde resin and baking at 275°-300° F. to polymerize the bakelite. WLC (13)

Causes and Prevention of Defective Castings. (Ueber Ausschuss, dessen Ursachen und Verhütung.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Jan. 22, 1933, pages 28-31; Feb. 5, 1933, pages 47-48. Discusses various causes and remedies of defective castings. The following 4 cases are distinguished: (1) defects due to improper construction of the casting, (2) defects due to inclusions of slags, sand, etc., (3) porosity, pipes and segregations, (4) shrinkage cracks and distortion of castings. GN (13)

Notes on Some Common Defects in Steel Castings. C. Howell Kain. *Foundry Trade Journal*, Vol. 48, Feb. 2, 1933, pages 95-96; Feb. 9, 1933, pages 108-110. Occurrence of cracks, draws and gas-holes in castings is discussed in connection with metal itself, design of the mold, rate of cooling, and agitation. Necessity and methods of releasing castings to allow for contraction is emphasized. No data are available regarding the influence of casting temperature. OWE (13)

Defects Caused by Improper Heat Treating. Eugene W. Nelson. *Heat Treating & Forging*, Vol. 18, Nov. 1932, pages 633-634, 641. Discusses softness and hardness caused by too high and too low tempering temperatures respectively; warping due to too rapid heating and cooling; warping, excessive crystal size, and decarburization during hardening caused by too high temperature; softness due to too slow cooling; incomplete hardening caused by insufficient exposure to heat; and soft spots, exfoliation, improper crystal size, formation of excessive hypereutectoid, and abnormality in case-hardening. MS (13)

Corrosion and Sediment Removal in Boilers. (Korrosion und Entschlammung bei Dampfkesseln.) H. Richter. *Die Wärme*, Vol. 55, Sept. 3, 1932, pages 617-618. Recent investigations disclosed that the mud in boilers includes considerable quantities of CO_2, which in conjunction with O_2 from air present in practically any boiler water, strongly corrodes the Fe underneath. Besides CO_2, the mud contains chemicals from the water purification means leading to caustic brittleness. The removal of slime is stressed and the latest means for this purpose are considered. EF (13)

The Detection of Internal Fissures in Rails. C. J. Allen. *Railway Engineer*, Vol. 53, May 1932, pages 177-179. Description of Sperry detector car now widely used on railways of U.S.A. and Canada for electrical detection *in situ* of fissure defects in rails. WH (13)

CHEMICAL ANALYSIS (14)

Spectral Analysis of Metals Solves Many Problems. G. Scheibe. *Iron Age*, Vol. 129, Apr. 7, 1932, page 832. See "The Place of the Emission Spectrum Analysis in the Metal Industry," *Metals & Alloys*, Vol. 4, May 1933, page MA 153. VSP (14)

An Extension of the Isoamyl Alcohol Separation of the Alkali and Alkaline Earth Metals to the Less Common Alkalies, Lithium, Rubidium and Cesium. Herman Yagoda. *Journal American Chemical Society*, Vol. 54, Mar. 1932, pages 984-988. In the qualitative analysis for all the alkali and alkaline earth metals, isoamyl alcohol acting on a mixture of the bromides effects a primary separation of the elements into two groups. The soluble group consists of Mg, Sr, Ca and Li bromides; it is further separated by simple methods involving the specific behavior of the nitrates upon ignition, solution in nitric acid and precipitation from isoamyl alcohol solution. MEH (14)

Further Examples of the Use of Adsorption Indicators in Volumetric Analysis. A. W. Wellings. *Analyst*, Vol. 58, June 1933, pages 331-333. $Pb(NO_3)_2$ and Pb acetate may be determined rapidly in M/10 and M/100 concentrations by titrating standard NaOH solution with the Pb solution. Fluorescein, dichlorofluorescein and dibromofluorescein may be used as absorption indicators. The end point is indicated by the permanence of a pink color on the precipitate of $Pb(OH)_2$. The Pb salt must be run into the caustic. AHE (14)

Volumetric Determination of Manganese after Oxidation by Periodate. Hobart H. Willard & J. J. Thompson. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 3, Oct. 15, 1931, pages 399-401. Mn up to 30 mg. can be determined by oxidation to permanganate with periodate in either phosphoric or H_2SO_4 solution, removal of excess periodate by precipitation as mercuric salt, and reduction of the permanganate by standard ferrous sulphate. The reaction goes best in a phosphoric acid solution, in which case less than a mg. of Cr does not interfere. Co, Ce, and chloride must be absent. MEH (14)

Development and Status of Quantitative Spectroscopic Analysis. I. Physical Fundamentals and Methods. (Entwicklung und Stand der quantitativen Spektralanalyse. I. Physikalische Grundlagen und Verfahren.) F. Waibel. **II. Spectroscopic Analysis in the Study of Metals in Practice. (Spektralanalytische Metalluntersuchungen in der Praxis.)** O. Findeisen. *Zeitschrift für Metallkunde*, Vol. 25, Jan. 1933, pages 6-12, 12-16. A review. Spectra of elements, excitation of spectra, observation of spectra, flame analysis, spark analysis with solutions and with solid electrodes, evaluation of photograms, sensitivity and accuracy; illustrated by reproductions of a number of spectra. II. Advantages and disadvantages of spectroscopic analysis in comparison with chemical analysis, construction of apparatus, qualitative and quantitative methods of spectroscopic analysis, Gerlach and Schweitzer's absolute method of homologous line pairs, the logarithmic wedge-sector method of Scheibe and Neuhauser, methods of increasing accurate quantitative emission spectroscopic analysis. Spectroscopic and chemical analysis are compared in a number of metals and alloys: Sn in Pb; Bi, Cu, Sn in Pb; Ni in an Al piston alloy. Within certain limits metals and alloys may now be accurately analyzed by the use of emission spectra. RFM (14)

New Procedures for Chromium and Vanadium in Alloy Steels. Hobart H. Willard & Philena Young. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 5, May 15, 1933, pages 158-162. In Cr or V determinations in W steels the W is kept in solution throughout the analysis as a complex fluoride. Excess of permanganic acid used in oxidation of vanadyl ion in V determinations or formed during a persulphate oxidation of V and Cr may be reduced either by Na azide, followed by boiling to remove hydrazoic acid, or by Na nitrate at room temperature, followed by urea to destroy excess nitrite. In such steels oxidized diphenylamine sulphonic acid is used as internal indicator in titration of vanadic or chromic acids with ferrous sulphate. By this preliminary oxidation of indicator the blank is reduced to a very small value, and is sufficiently constant with definite procedures to be eliminated by proper correction. Usual direct method for Cr with addition of excess standard ferrous sulphate and back-titration with standard permanganate is applicable. These procedures for V and Cr in steels containing W are accurate and more rapid than those now in use. These same reducing agents have been applied to V and Cr determinations in steels without W, thereby shortening procedures now used. In these cases oxidized diphenylamine may be used as internal indicator for the titrations with ferrous sulphate. By the use of this indicator both in analysis and in standardization of ferrous sulphate, any blank correction for indicator is eliminated. MEH (14)

Application of Potentiometric Analysis in Steel Plant Laboratory. V. Determination of Molybdenum (Die Anwendung der potentiometrischen Massanalyse in Eisenhüttenlaboratorium. V. Die Bestimmung von Molybdän). P. Dickens & R. Brennecke. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 14, No. 17, 1932, pages 249-259. Two groups of methods for determination of Mo in steel are discussed: an analytic method by precipitation of Mo by salts in particular Pb-salts, and a reductometric method, especially by potentiometric titration. Exact instructions are given for first group for steels with a Mo content below 3% and free of W, for steels with more than 3% Mo and free of W, and for steels containing W. In second group, 2 new methods were developed: Mo is determined in pure solutions with mercuroperchlorate or Pb-perchlorate. A general method for steel analysis by stannochloride was also developed which requires a little less time than usual and has been applied in practice with good success. Results of tests with individual methods are given in detail in tables. 29 references. Ha (14)

Contributions to Quantitative Emission Spectral Analysis. III. Determination of Copper in Pure Aluminum. (Beiträge zur quantitativen Emissions-Spektralanalyse. III. Die Bestimmung von Kupfer in Reinaluminium.) J. Clermont. *Zeitschrift für analytische Chemie*, Vol. 90, No. 1/2, 1932, pages 1-15. Spectroanalytic methods are well suited to detect Cu in Al. The whole system Al-Cu has been investigated spectro-analytically and a great number of homologous pairs of spectral lines were determined. Amounts of less than 0.02% Cu could be determined. Ha (14)

Indirect Estimation of Silicon in 48 to 52 Per Cent Ferro-silicons. George T. Dougherty. *Industrial & Engineering Chemistry, Analytical Edition*, Vol. 3, Apr. 15, 1931, pages 158-159. Describes a rapid and satisfactory method of estimating Si in 50% ferrosilicons by difference instead of directly. A result may be reported in about half a day or a little longer and will be very close to results obtained by the long direct method, at any rate close enough for technical purposes. It is far less difficult to check up in duplicate by the indirect than by the direct method. MEH (14)

Determination of Lead, Copper and Manganese in Manganese Bronze. James Brinn. *Chemist-Analyst*, Vol. 22, Mar. 1933, pages 14-15. This method is for samples containing more than 1% Mn which makes the electrolytic determination of Pb impossible. Use a 5 g. sample. Evaporate with HNO_3 to separate SnO_2 and the filtrate with H_2SO_4 to separate $PbSO_4$. After neutralizing the filtrate with NaOH and acidifying with H_2SO_4 add $(NH_4)_2S_2O_8$ and boil 30 min. to precipitate MnO_2. Filter, dissolve in HCl and determine Mn as $Mn_2P_2O_7$. Dilute the filtrate containing Cu to 50 cc. and use 100 cc. for the electrolytic determination. CEM (14)

Gravimetric Determination of Cobalt by Dinitroso-Resorcinol. (Zur gewichtsanalytischen Kobaltbestimmung durch Dinitrosoresorcinol). O. Tomicek & K. Komarek. *Zeitschrift für analytische Chemie*, Vol. 91, No. 3/4, 1933, pages 90-105. Renewed investigation of this method showed it not to be quantitative as claimed by its authors. Tests to improve the method were unsuccessful. Ha (14)

HISTORICAL & BIOGRAPHICAL (15)

Greek and Roman Plated Coins. W. Campbell. *Numismatic Notes and Monographs* No. 57, 1933. Published by American Numismatic Society. 4½ x 6½ inches, 187 pages. Some ancient coins classed as counterfeits (Mimmi Subaerati) had a Cu core and a thin Ag surface. Some authorities consider that they were officially minted rather than counterfeited. The methods used in applying the Ag coating have been in doubt. Some 38 coins, mostly dating from a few years B.C. back to 400 or more B.C., were sectioned and examined metallographically. The Ag-Cu eutectic appeared at the joint and its position in regard to the laps in the Ag coating gave clues as to the mode of joining. In some cases the Cu slug was evidently enclosed in disked pieces of Ag foil and heated until the eutectic formed at the junction, without melting the Ag foil itself. In others, a solder of about eutectic composition seems to have been used between the Cu and the foil. In some there are traces of what may be flux. In still others no foil was used, and Ag powder, or perhaps a powdered Ag-Cu alloy and flux, appear to have been sprinkled on the Cu surface and heated until the powder melted. The coatings generally appear too thin to have been made by dipping in molten Ag or Ag alloy, although a couple of the coins might possibly have been so produced. The coins were struck after the blank had been plated. The coins themselves are illustrated and many micrographs shown of the structures at the junction of Cu core and Ag coating. The art of Ag soldering and the process of joining Ag to Cu without solder (later rediscovered and used in making Sheffield plate) was evidently known at least 300 B.C., for numismatists believe some of the coated coins were contemporaneous with solid silver ones of such dates. HWG (15)

History and the Present Practice of Wire Drawing. D. Morgan Rees. *Proceedings South Wales Institute of Engineers,* Vol. 49, Feb. 10, 1933, pages 4-12; *Sheet Metal Industries,* Vol. 6, Mar. 1933, pages 699-702. History of wire drawing is reviewed from Biblical times to date. Present practice is described. AHE + AWM (15)

Metallurgy at Broken Hill. W. E. Wainwright. *Proceedings Australasian Institute Mining & Metallurgy,* No. 87, Sept. 30, 1932, pages cxxxv-cxli. An historical résumé of metallurgical developments at Broken Hill is given. AHE (15)

King Tut's Purple Gold. *Science Supplement,* Vol. 77, Jan. 6, 1933, page 9. Ornaments of purple gold found in tomb of Tut-Ankh-Amen proved to be of Au with some Fe present. Ha (15)

Two Pioneers in American Metallurgy (Thomas Egleston, Alexander L. Holley). W. Campbell. *Columbia University Quarterly,* Vol. 25, Mar. 1933, pages 26-33. Paintings of Egleston, founder of Columbia School of Mines in 1864, and of Holley, lecturer there on iron and steel 1879-1882, and famed for his development of the Bessemer process, have been hung in School of Mines. Biographies have been previously published and are summarized in this article. HWG (15)

An Egyptian Axe Head of Great Antiquity. H. C. Carpenter. *Nature,* Vol. 130, Oct. 22, 1932, pages 625-626. Article shows that 6000 years ago the Egyptians were casting, heat-treating and cold-working Cu alloys. Brinell hardness tests prove the retention of cold work in alloys of this type. Analysis: 97.35% Cu, 1.28% Ni, 0.49% As, 0.17% Pb, 0.15% Fe, 0.06% Mn, and 0.5% O_2 besides traces of Sn and Sb. Kz(15)

The Charcoal Iron Industry of the Hanging Rock Iron District, Its Influence on the Early Development of the Ohio Valley. W. Stout. *Ohio Archaeological & Historical Quarterly,* Vol. 42, Jan. 1933, pages 72-104. Interesting historical account of southern Ohio blast furnaces built from 1826-1875, at which date 85 furnaces were in existence in this region. The furnace construction and operation, the mining and calcining of the ores, the burning of charcoal, quarrying of limestone, and the transportation facilities are described, with comment on the social life of the furnace communities in their heyday. HWG (15)

Wire Drawing, Ten Centuries Old, Made Its Real Advances in Last Hundred Years. Kenneth B. Lewis. *Iron Age,* Vol. 130, July 14, 1932, pages 58-61, adv. sec. page 16. Earliest reference to wire drawing die is in a Latin manuscript written about 100 A.D. by Theophilus. Dies have been found dating back to the Vikings in Norway about the years 700 to 800 A.D. Drawing wire through a die was well established about the year 1000. Very little is said about coating and lubrication. Up to 1650 there is no reference made to coating. Prior to lime coat 1860-1880, the flour coat was used possibly 1850 to 1890. Mechanical thrashing succeeded hand scouring of scale. First description of die making dates back 100 years. Between 1500 and 1600 high speed hammers become available. About the time of early settlement of America, rods of Fe were produced by hammering and by slitting mill and cleaned by hand. First modern note on rod production was in 1828. VSP (15)

History of the Copper Industry in the U.S.A. (Apercu Historique de l'Industrie du Cuivre aux Etats-Unis.) Eug. Prost. *Revue Universelle des Mines,* Series 8, Vol. 8, Nov. 1, 1932, pages 276-283; Nov. 15, 1932, pages 303-311; Dec. 1, 1932, pages 330-335; Dec. 15, 1932, pages 355-365. The origin and working of Cu ores and Cu mines are described; maps and charts of deposits, statistics of amount and value of production are given. The different processes of reduction and electrolytic processes and the equipment used by different companies, their output, special furnaces are explained and the present economic situation, stocks on hand and outlook for the future development discussed. Ha (15)

Doublé. (Doublé.) R. Rücklin. *Deutsche Goldschmiedezeitung,* Vol. 23, March 25, 1933, pages 128-132. After discussing at length the historic development of the manufacture of gold doublé articles special points to be observed in processing and the machines used are considered. GN (15)

Report about the Mines in the United States of America, 1783. Samuel Gustaf Hermelin. Translated from Swedish by Amandus Johnson. John Morton Memorial Museum, Philadelphia, 1931. Cloth, 6¼ x 9¼ inches, 82 pages. Price $3.00. This is a document of much historical interest. In 1782, King Gustavus III of Sweden was interested in finding out the extent and prospects of the iron industry of the United States, and sent Hermelin, a mining engineer, over to study and report on it. This report, from the Swedish archives, has just been translated and annotated. The U. S. ores then known and worked lay near the coast in New Jersey and Maryland and in the mountains of Pennsylvania. He mentions an iron works near Lake Champlain, operated during the Revolutionary War, as idle during his visit in 1783, but says that good supplies of iron ore are reported in the mountains near it. He says he has seen samples of good iron ore from the neighborhood of Pittsburgh and that it is proposed to establish iron works there since coal mines have been worked there for several years. Hand smithing is mentioned as an important industry in Bethlehem. He cites rumors about ore on the Mississippi and vague ones about it in the "Illinois country." A good many blast furnaces and iron mills are mentioned as abandoned because of lack of timber for charcoal or because the local ore was worked out; in one case, he mentions that no other ore was available within ten miles. Hermelin views everything from the economic angle; he was a good engineer. He discusses output, wages, (and subsistence of slaves instead of wages, but says that the negroes in Virginia and the Southern states increase to such an extent that the purchase price for them cannot be regarded as lost when they die) taxes, fuel consumption and all factors of production costs. He describes the smelting and forging processes in general terms but in no great detail since the Swedes who were to use the report were doubtless fully familiar with all processes then known. The total capacity of all the works in the U. S. in 1783 was estimated at 10,000 tons of bar iron. Those interested in the early history of metallurgy in the U. S. will find this little book very fascinating. H. W. Gillett (15)-B-

Ancient Blast Furnace Produced Iron for Munitions in Napoleonic Wars. *Steel,* Vol. 90, May 9, 1932, page 39. Description of remains of an abandoned blast furnace built in 1753 on banks of Loch Etive in Scottish highlands. JN (15)

ECONOMICS (16)

Silver in 1932. *Mining Journal, Annual Review No.,* Vol. 180, Feb. 11, 1933, page 2. World production of virgin Ag in 1932 is estimated at 161,000,000 oz., a decline of 33,000,000 oz. from 1931. Secondary Ag output is estimated as 46,600,000 oz., a 22,000,000 oz. decline from 1931. AHE (16)

Manganese. *Mining Journal, Annual Review No.,* Vol. 180, Feb. 11, 1933, page 14. Production of Mn declined with steel industry. Several new alloys were developed in 1932. A steel of Cr 17-19%, Mn 5-10%, and small amounts of Cu and Ni is stainless. Its properties are discussed. AHE (16)

Federated Malay States in 1932. *Mining Journal, Annual Review No.,* Vol. 180, Feb. 11, 1933, page 29. The Sn industry is reviewed. AHE (16)

British Columbia in 1932. *Mining Journal, Annual Review No.,* Vol. 180, Feb. 11, 1933, pages 27-29. Production of Au, Ag, Pb, Zn, Cu, etc., in British Columbia in 1932 is discussed. AHE (16)

Chromium. *Mining Journal, Annual Review No.,* Vol. 180, Feb. 11, 1933, page 15. Advances in Cr alloys and in Cr plating place industry in an excellent position to gain rapidly with better industrial conditions. AHE (16)

Titanium. *Mining Journal, Annual Review No.,* Vol. 180, Feb. 11, 1933, page 14. Use of Ti in steel is increasing. Addition of 0.1-0.2% Ti to Al produces a remarkable fining of structure and improves physical properties. 0.5% Ti in Al increases its corrosion-resisting properties. Ti increases hardness and tensile strength of Cu. AHE (16)

Iron and Steel Industry in 1932—Advance Summary. H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M.M.S. 192, Apr. 20, 1933, 6 pages. Fe ore mined in U. S. in 1932 amounted to 9,846,916 gross tons, a decrease of 68% from 1931, 83% below the av. for 1927-31, and was lowest since 1885. Shipments decreased 81%; stocks increased 35% to 17,603,873 tons, largest ever accumulated. Pig Fe production was 8,549,649 tons, 52% less than 1931 and 74% less than 1927-31 av. An av. of 1.770 tons of metalliferous materials was consumed per ton of pig Fe as compared with 1.887 tons in 1931. Production of ferro-alloys of all classes in 1932 amounted to 230,311 tons, a decrease of 51%. In making ferro Mn, 10.5 of domestic Mn ore was used as compared with 4.1% in 1931. Production of ferro Mn was 56,350 tons, spiegeleisen 37,317 tons, ferro V 109 tons and ferro W 246 tons. AHE (16)

Manganese Ore Industry in 1932—Advance Summary. H. W. Davis. *United States Bureau of Mines, Mineral Market Reports* No. M. M. S. 191, Apr. 21, 1933, 4 pages. Shipments of Mn ore (35% or more Mn) from domestic mines in 1932 were 17,777 long tons, valued at $377,222, compared with 39,242 tons valued at $699,121 in 1931. Shipments in 1932 included 9,963 tons of metallurgical ore and 7,012 tons of battery ore. Puerto Rico supplied 2,302 tons more. Montana supplied 87% of the total ore shipped. Ala., Ark., Ga., and Va., were the other producing states. Imports of Mn ore in 1932 were 110,634 long tons valued at $1,219,383, as compared with 502,518 tons worth $5,104,590 in 1931. Of the imports, 50% was from Russia, 22% from the Gold Coast, and 19% from Brazil. AHE (16)

A Review of the Mineral Production and Resources of South Africa. T. Nimmo Dewar. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 33, Sept. 1932, pages 54-71. Total mineral production of S. Africa through 1931 was £1,600,000,000, of which 71.8% was gold. Between 1929 and 1931 the value of the output of the following declined: Diamonds, coal, Cu, Sn, asbestos, Pt, Ag, osmiridium, other minerals, coal by-products and quarry products. Output of Au, Mn, soda, chrome, beryl and mineral paints increased. AHE (16)

Silver, Copper, Lead, and Zinc in the Central States in 1931. J. P. Dunlop & H. M. Meyer. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Jan. 1933, pages 237-263. Total value of mine production of Ag, Cu, Pb, and Zn in Central States was $34,113,936 in 1931, less than ½ of 1930. Ag production was 42,737 ozs. (179,827 ozs. in 1930), Cu output was 118,059,491 lbs. (169,558,013 lbs. in 1930), Pb production was 181,648 short tons (237,533 tons in 1930), and Zn output was 130,476 short tons (233,835 tons in 1930). AHE (16)

Secondary Metals in 1931. J. P. Dunlop. *United States Bureau of Mines, Mineral Resources of United States, 1931,* Part 1, Jan. 30, 1933, pages 317-330. Total value of certain nonferrous metals recovered from secondary sources, as reported to Bureau of Mines, was $110,674,600 in 1931, a decrease of 43%; quantity decreased 21%. Production in short tons for 1930 and 1931, respectively, was: Cu 332,800, 261,000; brass 192,000, 122,800; Pb as metal 129,000, 128,800; Pb in alloys 126,800, 105,900; Zn as metal 49,300, 34,800; Zn in alloys other than brass 7,700, 7,400; Sn as metal 5,600, 5,500; Sn in alloys and chemicals 20,600, 14,300; Sb 8,082, 7,900; Al as metal 19,700, 15,200; Al in alloys 18,900, 15,100; Ni as metal 500, 270; and Ni in alloys and salts 2,400, 1,800. AHE (16)

The Mineral Position of the British Empire. Charles Camsell. *Transactions Canadian Institute of Mining & Metallurgy,* 1932, pages 15-29, 387-388. See *Metals & Alloys,* Vol. 3, Dec. 1932, page MA 353. AHE (16)

Government Interest in the Steel Industry. *Engineer,* Vol. 153, May 6, 1932, pages 506-507. From an address delivered by John Colville before British Steelwork Association, London, Apr. 29, 1932. Outlines work of various departments of British government which are organized to study needs of iron and steel industry. LFM (16)

Newest Official Figures of German Iron and Steel Foundries. (Die neuesten amtlichen Zahlen über die deutschen Eisen und Stahlgiessereien). A. V. Buelow. *Die Giesserei,* Vol. 20, Feb. 3, 1933, pages 50-52. Statistical data for 1930 and 1931 on production, value, men employed, production per man, ratio of wages to total cost, export, etc. Ha (16)

Zinc Dust Consumption at Canadian Gold Mines. A. Buisson. *Canada Department of Mines, Mines Branch, Memorandum Series* No. 59, Apr. 1933, 6 pages. Canada produces about 100 tons of Zn dust a year. Over 95% of Canadian production is used as a precipitant of Au in the cyanide process, the rest in dyeing, the chemical industries, and in sherardizing. Canadian Au treatment plants used 523,000 lbs. of Zn dust in 1932, 431,000 lbs. in 1931. Consumption is 0.043 to 0.330 lbs./ton of ore milled, with an average of 0.122 lb. AHE (16)

Development and Present Status of Aluminum Production in Russia. (Entwicklung und gegenwärtiger Stand der Aluminium gewinnung in Russland). *Aluminium,* Vol. 14, Dec. 15, 1932, pages 5-6. Historical and statistical data; new plants on the river Daghestan are intended for a yearly production of 75,000 tons from ore deposits of Saglik which are estimated at 93 million tons with 10 million tons of pure Al. Ha (16)

Registration, Production, Marketing Data, Exports and Specifications. *Automotive Industries,* Vol. 68, Feb. 25, 1933, pages 216-260. Canadian, European, and U. S. production and specifications for automobiles, Diesel engines, airplanes and automotive materials are detailed in a series of tables, for the year 1932. This series of tables is published annually and is of real value to the manufacturer and consumer alike. DTR (16)

Italian Aluminum-Compound Industry. (Die italienische Industrie der Aluminiumverbindungen). *Die Chemische Industrie,* Vol. 56, May 6, 1933, pages 324-326. Prior to 1930 Italy imported ½ to 2/3 of its Al-compound requirements. Although official figures are not yet available for 1931 and 1932, approximately 80-90% of requirements were met by domestic production. Gives production and import data for 1927-1932 for various Al compounds. RRS (16)

PLANTS & LABORATORIES (17)

Heat Treating Department of Dominion Engineering Works. G. E. TAIT. *Iron & Steel of Canada*, Vol. 16, Jan. 1933, pages 3-4. Brief description of modern heat-treating department of this plant at Lachine, Que., where a variety of plain and alloy steel parts are treated. OWE (17)

Stalin's Pet. WALTER H. ELLIS. *Iron & Steel of Canada*, Vol. 15, Aug. 1932, pages 91-95. Description of blast furnaces at Magnitgorsk and social conditions in and about the plant. Sketch map and 4 photographs. OWE (17)

Recent Developments in Mechanizing Hull Foundry. VINCENT C. FAULKNER. *Foundry Trade Journal*, Vol. 47, Nov. 17, 1932, pages 301-304. A description of modern foundry of National Radiator Co., Hull, Eng. Considerable space is devoted to the methods of cupola charging. OWE (17)

The Foundries of Messrs. S. Russell and Sons, Limited. VINCENT C. FAULKNER. *Foundry Trade Journal*, Vol. 48, Apr. 20, 1933, pages 281-284. 11 photographs illustrate methods and plant of this company which specializes in alloy cast irons. OWE (17)

Automatic Machines Speed Roller Chain Production. HERBERT R. SIMONDS. *Iron Age*, Vol. 130, Nov. 17, 1932, pages 758-760. Roller chain manufactured by Baldwin-Duckworth Mfg. Co., Springfield, Mass., is made of 2 types of link units known as roller links and pin links. Many unique automatic operations are employed. Gives the highlights in the production of this type of chain. VSP (17)

Copper Rod Rolling Mill of Eugene F. Phillips Electrical Works, Ltd. R. C. LEWIS. *Wire & Wire Products*, Vol. 8, Jan. 1933, pages 5-8, 25. A detailed description of layout and equipment of mill with a nominal capacity of 30,000 lbs./hr. based on production of ¼" rods. Rounds, squares and rectangular sections are rolled. Ha (17)

Otis Completes 72-in. Continuous Mill. F. L. PRENTISS. *Iron Age*, Vol. 129, Apr. 21, 1932, pages 924-926, adv. pages 18, 20. Describes mill recently put into operation by the Otis Steel Co., Cleveland. The capacity of the mill is 50,000 tons per month and will make sheets from 24" to 65" wide and from No. 16 gage to ¼" thick. VSP (17)

The Laboratories of the Ore Dressing and Metallurgical Division, Mines Branch, Department of Mines, Ottawa. C. S. PARSONS. *Transactions Canadian Institute of Mining & Metallurgy*, 1932, pages 249-251. See *Metals & Alloys*, Vol. 3, Mar. 1933, page MA 81. AHE (17)

Synchronizing Oven Operations in Refrigerator Manufacture. PHILIP KRIEGEL. *Iron Age*, Vol. 129, Mar. 24, 1932, pages 716-720. Describes manufacture of G. E. refrigerators. Conveyors make continuous progress of parts from raw material to finished product possible. Ovens consist of upper and lower compartments to permit the travel of a conveyor in each compartment. VSP (17)

Repairing and Manufacture of Laminated Springs of Alsace-Lorraine Railways at Bischheim. (La réparation et la confection des ressorts à lames aux chemins de fer d'Alsace et de Lorraine à Bischheim.) M. KOENIGER. *Revue Générale des Chemins de Fer*, Vol. 51, Feb. 1932, pages 112-119. Layout of new centralized repair shops, heat treating, bending and hardening facilities for old springs are illustrated and discussed at length. Balance of the paper takes up making of new laminated springs. WH (17)

The Foundry Industry of Czecho-Slovakia. MONT. FR. PISEK. *Foundry Trade Journal*, Vol. 48, Jan. 19, 1933, pages 37-40; Jan. 26, 1933, pages 71-73. Views of several foundries and machine shops in C-S. Several modern plants are described and the source of refractory materials is indicated. The outputs of some of the concerns are given. OWE (17)

History and Development of Material Testing Laboratory Darmstadt. (Geschichte und Entwicklung der Materialprüfungsanstalt.) O. BERNDT. *Schriften der Hessischen Hochschulen*, 1932, No. 4, pages 4-16. Paper before Staatliche Materialprüfungsanstalt, Technische Hochschule Darmstadt, Oct. 29, 1932. After giving history of material testing in general development of above mentioned institute is dealt with. Institute is now equipped with 15 static testing machines for tension, compression, transverse and torsion tests, and 47 various types of endurance testing machines. GN (17)

Blast Furnace Plant at Kuznetzk Metallurgical Works. A. SELESNEW. *Domez*, No. 6. 1932, pages 20-24. (In Russian.) Layout of plant combines German and American practice. 4 blast furnaces are planned, 2 of 750 tons/day and 2 of 1000 tons/day. The first are of Freyn design, latter of plant engineering staff. American practice is followed throughout. Structural details of stacks and auxiliary equipment are given in full. (17)

New Ford Factory. *Electrician*, Vol. 109, July 1, 1932, page 10; Aug. 12, 1932, pages 193-195. New factory at Dagenham, England, is self contained as it includes power house, blast furnace, coke ovens and by-product plant. London refuse is consumed to generate power. Engineering shops cover 28 acres. Among electrical equipment are more than 30 electric furnaces of various design and types. Most are continuous type including rotary hearth, chain conveyor, overhead conveyor, and pusher types of conveying mechanism. CBJ (17)

The New Mechanised Foundry of Messrs. Ferranti, Limited. *Foundry Trade Journal*, Vol. 47, Aug. 4, 1932, pages 65-69. Describes very completely the melting plant and other departments of the new foundry of Messrs. Ferranti, Limited. The foundry comprises a stock and cupola bay, a continuous casting bay, a non-ferrous bay, and a main bay for the production of general and Nomag castings. OWE (17)

Dagenham Works of the Ford Motor Company, Limited. *Foundry Trade Journal*, Vol. 47, Sept. 22, 1932, pages 171-172. Brief description of the new works erected by Ford Motor Company, Limited, at Dagenham, Essex, England. OWE (17)

British Cast Iron Research Association. *Foundry Trade Journal*, Vol. 47, July 14, 1932, pages 20-22, 26. An article, accompanied by 4 photographs (showing portions of the new laboratory extension which was opened on July 6, 1932, at Birmingham, England) and containing the speeches made by the President of the Association and by Lord Rutherford at the time of its opening. OWE (17)

The B.C.I.R.A. Laboratories Re-Visited. *Foundry Trade Journal*, Aug. 4, 1932, page 63. A brief description of the new laboratories of the British Cast Iron Research Association, which includes a diagrammatic plan of these laboratories. OWE (17)

The Openshaw Foundry of Joseph Stubbs, Limited. *Foundry Trade Journal*, Vol. 47, Aug. 18, 1932, pages 91-93, 98. General layout of above foundry is dealt with in considerable detail. OWE (17)

Capacity of 800,000 Tons of Ingots Annually Added to Gary Open-Hearth Plant. *Iron Age*, Vol. 129, May 12, 1932, pages 1064-1065. Describes 7 open-hearth furnaces installed at Gary plant of Illinois Steel Co. New units are of stationary type, each of 150 ton capacity. VSP (17)

The Manufacture of Steel Tubes. *Fuel Economist*, Vol. 7, Sept. 1932, pages 499-505. Importance of manufacture of steel tubes and pipes specially to meet modern requirements is recognized by all engineers. Article describes methods, plant and equipment at British Mannesmann Tube Co., Ltd., Newport, for producing weldless and lap-welded tube, screwed and flanged pipe, weldless poles, etc. Progressive steps taken to insure accuracy of production is discussed as well as detailed research work to which raw material and finished products are subjected in regard to composition and mechanical reliability. DTR (17)

Material Handling in the Small Brass Foundry. D. G. ANDERSON & B. F. MCAULEY. *Transactions American Foundrymen's Association*, Vol. 3, Sept.-Oct. 1932, pages 310-324; *Foundry Trade Journal*, Vol. 46, May 12, 1932, pages 289-290. Description of brass foundry at Hawthorne works of Western Electric Co. CHL + OWE (17)

LABORATORY APPARATUS (21)

Hard Metal Widia in the Hands of the Chemist. (Das Hartmetall Widia in der Hand des Chemikers.) CURT AGTE. *Die Chemische Fabrik*, Vol. 6, Jan. 4, 1933, pages 5-6; *Die Naturwissenschaften*, Vol. 21, Feb. 10, 1933, page 150. Use of Widia or tungsten carbide for tools is well known. It is extremely hard, has a high melting point and good chemical resistance. Other materials which have similar properties are the carbides of Ta, Ti and Mo. In the laboratory Widia is very useful for machining glass. Articles can be machined entirely from glass. It is also used for glass cutters, mortars and pestles, and sand blast nozzles. EF + CEM (21)

Determination of Total Oxygen and Nitrogen in Steel. Correspondence from HANS DIERGARTEN. *Metal Progress*, Vol. 22, Aug. 1932, pages 47-49. Describes high frequency induction furnace operated with a vacuum of .0001 mm. Hg at temperatures of 1600°-1700° C. (2912°-3092° F.) for determination of gases in steel. Apparatus may be made to produce 16 determinations in 10 hours with duplicate determinations checking within .0002%. Diagram shows construction of furnace. WLC (21)

Slide Rule for Conversion of Weight Percent Into Atomic Percent. (Ein Rechenschieber zur Umrechnung von Gewichtsprozenten in Atomprozente.) C. HERMANN. *Metallwirtschaft*, Vol. 12, Feb. 24, 1933, pages 104-105. Special slide rule is described and illustrated with which the % by weight of an element in a compound, alloy, or radical can be quickly converted into atomic % and vice versa. Two examples are worked out in detail. CEM (21)

Apparatus for Measuring Thermal Conductivity of Metals in Form of Wire or Ribbons. (Appareil pour mesurer la conductibilite thermique des metaux mis sous forme de fil ou ruban.) PIERRE VERNOTTE. *Chimie et Industrie*, Vol. 27, Special Number, Mar. 1932, pages 393-396. A wire was soldered at one end to a furnace heated to a uniform known temperature, W_1, which is transmitted to the soldered end of the wire. Heat was conducted along the wire and distributed into the surrounding atmosphere by convection. The wire acquired a mean temperature, V_1, and the law of distribution of temperatures through the length of the wire was deduced from V_1 and W_1. The mathematical theory and the construction and operation of the instrument are described. MAB (21)

New Microscope Designed for Production. L. A. DANSE. *Metal Progress*, Vol. 22, Aug. 1932, pages 21-29. Describes in detail metallographic equipment of Cadillac Motor Co. for production examinations. Maximum comfort and convenience in use is provided as well as special features for improving quality of work. WLC (21)

A New Method of Thickness Measurement of Metal Films. S. TANAKA. *Report Aeronautical Research Institute*, Tokyo, Vol. 7, Jan. 1933, pages 293-309. In the introduction 2 ways of measuring thickness of thin metal films on glass surfaces are criticized. (1) Method of weighing the metal film, (2) method of measuring the displacement of interference fringes. Both methods are called unreliable while the new one is claimed to be applicable to thicknesses less than 0.01 micron, even when the metal surface is somewhat granular. The recently discovered method of thickness measurement by interference of X-rays is reliable but only applicable to extremely thin films, and when the film surface is so uniform that the surface appears quite bright. Observations according to the new method are carried out by microphotographs, gained on a metal film deposited on a glass plate. One half of the film area is scraped off and the reflections on the metal film surface and glass carrier are determined. The article explains at length the principle of the method and the arrangement of apparatus and gives the derivation of the underlying formulae. Kz (21)

A New Form of the Filter Stick: Its Use in Gravimetric Analysis. EARL J. KING. *Analyst*, Vol. 58, June 1933, pages 325-328. The soluble material is drawn off by means of a short tube of narrow bore closed by a small plate of sintered quartz or glass or unglazed porcelain or by a plug of asbestos, Pt sponge or filter paper. AHE (21)

A Novel Analysis Scale Provided with Damping and Projection Reading Devices. (Neue Analysendämpfungswage mit Projektionsablesung.) SARTORIUS. *Zeitschrift für Instrumentenkunde*, Vol. 52, July 1932, pages 328-329. The damping cylinders are arranged directly under the scale beam and the reading of the damped deflection from a micro-photographic scale is performed by a microscope or with the latest model by projecting the scale to a ground glass. 0.1 mg. can be read off directly. EF (21)

Micro-Melting Point Determination and Micro-Sublimation. (Über Mikroschmelzpunktsbestimmung und Mikrosublimation.) L. KUFLER. *Forschungen und Fortschritte*, Vol. 8, Oct. 1, 1932, pages 356-357. Observation of melting procedure of small particles and crystals heated on a metal plate under the microscope. EF (21)

X-Ray Spectroscopy by Means of Curved Crystal Reflectors. (Röntgenspektroskopie mittels gekrümmter Kristallreflektoren.) L. v. HAMOS. *Die Naturwissenschaften*, Vol. 20, Sept. 16, 1932, pages 705-706. Salient feature of new X-ray spectograph is a hollow cylindrical crystal, lattice planes being parallel to tangential plane in every case. Wave length differences between lines Cu-$K_{\alpha 34}$ and Ta-$L_{\alpha 2}$ have been determined with certainty. Small dimensions of apparatus are stressed. The distance slit-image is 30 cm. while dispersion corresponds to a Bragg spectrograph of 120 cm. diameter. Gain in intensity is considerable. Whole spectral range with stationary crystals can often be secured. If length of reflector does not suffice, further parts of spectrum can be obtained by parallel shifting of slit or of crystal. Tests are under way to construct a microscope for X-rays based on crystal faces curved in another fashion. EF (21)

World's Largest Testing Machine Applies Loads up to 3,000,000 lb. *Iron Age*, Vol. 129, Mar. 17, 1932, page 669, *Steel*, Vol. 90, Feb. 8, 1932, pages 34-35. Machine was built by Baldwin-Southwark Corp. for use by the University of California. It is able to test columns up to 33 ft. 6 in. long in compression and up to 4,000,000 lb. load. The table of the testing machine is stationary. One of the unusual and unique features is the highly refined control which is incorporated. Devices are mounted for maintenance of constant load over an indefinite period, for application of load at constant rate of load increment, start and stop inching button for motor control. VSP (21)

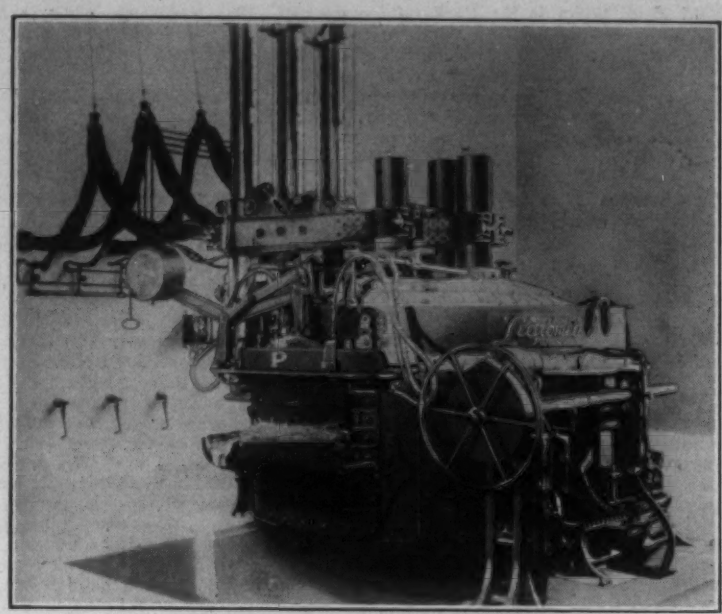
Vibration-less Mounting of Microscopes. (Erschütterüngsfreie Apparataufstellung.) A. KÖHLER. *Zeiss Nachrichten*, July 1932, pages 26-28. Description of new arrangements for vibration-less mounting of microscopes and other apparatus. GN (21)

A Microscope for the Investigation of Metals in Polarized Light. (Ein Mikroskop zur Untersuchung von Metallen im auffallenden polarisierten Licht.) A. GRABNER. *Montanistische Rundschau*, Vol. 34, Aug. 1, 1932, pages 9-11. Detailed description of a microscope developed by the Reichert Co., Vienna. GN (21)

Workshop Spectroscope for Steel Examination. *Engineering*, Vol. 132, Dec. 11, 1932, pages 746-748. Illustrates and describes Spekker Steeloscope made by Adam Hilger, Ltd., London. LFM (21)

The Junkers Portable Calorimeter. (Das Tragkalorimeter der Firma Junkers.) W. WUNCH & H. SEEBAUM. *Gas und Wasserfach*, Vol. 75, Aug. 6, 1932, pages 644-647. A new portable calorimeter is described which is independent of the water supply and particularly fit for use in the plant. Comparative tests between the Junkers standard calorimeter and the new one gave satisfactory results. The influence of variable temperature conditions on the accuracy of determinations of the calorific power was checked and found to be very small. For this reason it is most adaptable to the above mentioned purpose. GN (21)

New Tools for High-Temperature Research. ROBERT B. SOSMAN. *Industrial & Engineering Chemistry*, Vol. 23, Dec. 1931, pages 1369-1374. Apparatus and materials of construction for the maintenance of high temperatures, and instruments for temperature measurements, are discussed with the view of assuring uniform high temperatures. MEH (21)



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FOUNDRY PRACTICE & APPLIANCES (22)

Cupola Control—Its Progress, Practice and Value in the Iron Foundry. E. WHARTON. *Foundry Trade Journal,* Vol. 48, Feb. 16, 1933, pages 124-126. A summary of progress in cupola-control methods, including design, blowing methods, heat losses, use of secondary tuyeres, linings and slag control. OWE (22)

Chaplets. WM. F. CHUBB. *Foundry Trade Journal,* Vol. 47, Oct. 20, 1932, pages 236, 242. The mechanism of fusion in chaplet materials surrounded by rapidly cooling molten metal is illustrated by considering the Fe-C equilibrium diagram. The chaplet material absorbs C from, say, molten cast-iron and the melting point at the surface is sufficiently lowered for fusion, to take place and for a composition corresponding to that of the molten metal to be attained. Unless C is absorbed, the temperature does not remain sufficiently high long enough to cause fusion of the chaplet material. Photomicrographs are given to illustrate the various cases which can occur. Cleanliness of the surfaces involved is an important factor. OWE (22)

Rapid progress in casting metals calls for superior foundry control

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Read these abstracts and be well informed. Sections 12a on "Melting and Refining," 12b on "Casting and Solidification" and 23 on "Furnaces and Fuels" also contain information of value to you.

Making the Mold of a Vacuum Cylinder. (Die Herstellung der Form eines Vakuum-Luftzylinders.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Feb. 19, 1933, pages 80-82. Detailed discussion of the molding procedure followed. The cylinder had a height of 900 mm., an inner diameter of 750 mm. and a weight of 1800 kg. GN (22)

Design of Molds for Silumin Castings. (Der Formenbau beim Silumin Kokillenguss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Feb. 19, 1933, pages 74-78. Detailed discussion of various points relating to the proper design of molds for Silumin castings. Effects of suitable parting and gating are shown, and tolerances of dimensions of such mold castings of various types are considered. GN (22)

Molding Plate and Core Position in Making Small Handwheels. (Wie müssen Modellplatte und Kernlage für kleine Handräder beschaffen sein?) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Jan. 8, 1933, pages 19-20. Practical hints are given for properly molding small handwheels with diameters up to 100 mm. GN (22)

Sweep Device for Molding Elliptically Shaped Parts. (Schablonervorrichtung zum Formen elliptisch begrenzter Gegenstände.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, May 14, 1933, pages 208-209. Illustrated description of the device. GN (22)

Attendance and Operation of the Cupola. (Die Bedienung und der Betrieb des Kupolofens in der Eisengiesserei.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, May 14, 1933, pages 193-194. Stresses following points: Cupolas cannot be operated according to a general scheme, and blowers must fit the cupolas. Of importance in cupola operation is the upkeep of the lining. Various methods of lining repair are considered. Melting and removal of the slag are dealt with. GN (22)

Simplification of the Production of Special Brasses. (Simplification de la Fabrication des Laitons Speciaux.) DUBERGET. *Revue de Fonderie Moderne,* Vol. 26, Oct. 10, 1932, pages 384-385. Cu-Zn-Ni-Mn bronzes have excellent qualities in range 60/40 to 58/42 of Cu-Zn. 1% Mn equals 0.5% Zn and 1% Ni equals 1.3% Cu. It is shown how, starting from a given scrap material the additions must be calculated to give a brass of definite composition. Ha (22)

Prevent Losses With Proper Gates and Risers. PAT DWYER. *Foundry,* Vol. 60, June 1932, pages 44-46. No. 30 of a series of articles. Fine close sand is not satisfactory for molding crankpin bushing on solid end type locomotive side rods. If no other sand is available pattern should be faced with half and half mixture of new and old sand containing 1 part flour, or any other binder, to 20 parts sand. Ferrules and other thin castings are gated on top. Adequately venting bushing cores, green or dry sand, is of great importance. Ideal mold is one that requires neither swabbing, patching or any other manipulation. VSP (22)

Prevent Losses With Proper Gates and Risers. PAT DWYER. *Foundry,* Vol. 60, Sept. 1932, pages 46-48. 33rd installment. Position of patterns is of importance in production of non-ferrous castings. When molds are poured on incline, patterns should be arranged so that metal enters lowest molds first and others in proper succession. Gates should be arranged so they act as feeders instead of suckers. Gates for polished castings must be designed to catch any foreign material which may fall from lip of pot or wash from sprue or runner. VSP (22)

Makes Permanent Mold Castings. PAT DWYER. *Foundry,* Vol. 60, May 1932, pages 18-21, 72. Describes foundry erected by De-Laval Separator Co. for production of Fe, brass, bronze and Al castings. Metal for both sand and permanent mold castings is melted in electric furnace with a capacity of 6 tons. Typical analysis for sand molded castings is: Si 2.20%, Mn 0.75%, S 0.10%, P 0.030%, total C 3.50%. Analysis of Fe in permanent mold castings is somewhat similar with the exception of Si and total C which are higher. VSP (22)

Casting of Small Paddle Wheels in Green Sand. (Das Giessen von kleinen Schaufelrädern in nassem Sand.) PRAKTIKUS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Jan. 8, 1933, pages 14-16. Discusses conditions to be followed in properly molding such small wheels with an outer diameter of about 140 mm. GN (22)

Testing Molding Sand. (Die Proben für die Formsandprüfung.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Feb. 19, 1933, pages 70-72. Compressibility tests of molding sands and the factors affecting compressibility are discussed. GN (22)

Construction and Price of Patterns. (Construction et Prix des Modeles.) LÖWER. *Revue de Fonderie Moderne,* Vol. 26, Dec. 10, 1932, pages 452-455. Discusses the influence of price of pattern on price of casting. Examples are shown how by proper arrangement and construction of a pattern its price may be greatly reduced. Ha (22)

Notes on the Newest Development of Cast Iron. (Streiflichter auf die neueste Entwicklung des Gusseisens.) G. MEYERSBERG. *Die Giesserei,* Vol. 19, Nov. 25, 1932, page 479. Present improvements in quality of cast irons are reviewed and it is pointed out that this is not due to haphazard methods but to application of scientific investigations. Examples are pearlite iron of Lanz, the stable casting method of Borsig-Haneman, and the Emmel method with higher or lower C content. The tensile strength is hereby increased to 30-34 kg./mm.^{2}. Use of diagram of "isoflexes" in valuation of cast iron is briefly explained and methods for obtaining desired C content in cupola process are discussed. Ha (22)

FURNACES & FUELS (23)

Determination of Temperature and Time of Heating in Rolling Mill Furnaces. N. J. Teitz. *Domez*, No. 2-3, 1933, pages 58-65. A method for calculation of time and temperature of a heated body is given based on data of Gerber, Schack and Tafel-Gruen. (23)

Heat Losses in Furnace Operations. S. N. Brayshaw. *Foundry Trade Journal*, Vol. 48, Apr. 6, 1933, pages 235-236. Discusses losses through an insulated furnace wall with and without cavities, losses through a lined wall, effect of increasing thickness of the wall, etc. OWE (23)

Heat Losses from Furnace Walls. J. H. Wright. *Foundry Trade Journal*, Vol. 48, Mar. 23, 1933, pages 212-213. Extended abstract of a paper presented before Cleveland Institute of Engineers. Advantages of insulation include considerable fuel-saving, reduction of no-load losses, and uniformity of temperature distribution. Disadvantages arise from poor mechanical properties of refractories, their lack of resistance to corrosion, and possible overheating of the furnace. One graph and 2 tables, show the effect of insulation on temperature of open-hearth furnace roof, and losses through lagged and insulated roofs of various thicknesses at various inside temperatures. The cost of insulating material is compared with the fuel-saving effected. OWE (23)

Melting Costs for Various Furnaces. H. E. White. *Foundry*, Vol. 60, Aug. 1932, pages 44-45. Gives an outline for non-ferrous melting which also is applicable to ferrous metals. Alloys difficult to handle should receive a higher pro-rata melting charge. Certain conditions tend to prevent reduction of various cost data to strictly comparable units. Following precautions should be observed: Thermal energy charges must be allocated; general labor charges also should be considered; and general maintenance items must be scrutinized carefully. VSP (23)

Some Developments in Metal Melting and Heating Furnaces. *Metallurgia*, Vol. 7, Mar. 1933, pages 137-142. Descriptions of a number of recently installed furnaces. JLG (23)

Rotary Furnaces in a Modern Foundry. W. Scott. *Foundry Trade Journal*, Vol. 48, Mar. 2, 1933, pages 157, 159. A summary of rotary furnace practice under the heads of supervision, adaptability and overloading. OWE (23)

Heating Steel for Forging, Furnaces and Operations. R. E. Waldron & N. L. Deuble. *Metal Progress*, Vol. 22, Oct. 1932, pages 33-38. Abstract of a paper for the Buffalo Convention, A.S.S.T., Oct. 1932. Modern furnace design and control and the speed at which steel will absorb heat are discussed. Increased efficiency of forge heating furnaces is due to design and use of hot gases formerly wasted. Advantages of back-fired over end-fired furnaces are given. Rotary furnaces usually have proved troublesome. Electric furnaces are unsatisfactory because of high cost of power and lower temperature. High B.t.u. fuel is necessary in gas firing, but is cleaner and easier to control. "Diffusion combustion" developments have improved performance of gas-fired furnaces. Furnace calculations are discussed and heating curves for various fuels presented graphically with a sample problem. Rate of heating in relation to analysis and size is discussed. WLC (23)

Combination Forge Furnace and Steam Boiler Saves Fuel. J. B. Nealey. *Iron Age*, Vol. 129, Mar. 31, 1932, pages 772-773, 817. Discusses development of forging furnace that is more efficient and materially reduces costs of forge heating plus steam power. This consists in passing waste heat from forge furnace into steam boiler which supplies power to hammer. This was worked out by Skookum Co., and Portland Gas & Coke Co. Combination forge furnace and steam boiler is equipped to operate automatically through steam pressure control, which in turn, regulates volume of fuel to auxiliary burner and 3 of the furnace burners. Use of steam accumulator to effect further economies is suggested. VSP (23)

Features of Modern Heat Treating Furnaces. E. G. Fiegehen. *Iron & Steel of Canada*, Vol. 16, Mar. 1933, pages 38-42. Functions which annealing furnace must perform are discussed. Writer deals with present practice in furnace design, which tends towards simplification and reduction in heat consumption per unit of charge. Methods whereby heat consumption can be reduced are discussed in detail, and growing importance of heat-resisting alloys is discussed. OWE (23)

Controlled Cooling for Heat-Treating Furnaces. A. N. Otis. *Iron Age*, Vol. 130, Sept. 22, 1932, pages 448-449, adv. sec. page 18. Methods adopted for cooling the furnaces are: (1) Alloy tubes are installed in heating chamber. Air is passed through tubes and discharged in room. This method extracts heat from furnace without admitting air to chamber. (2) Recirculating system is provided for furnaces containing artificial atmosphere, such as H. Gas is drawn from furnace through surface cooler by means of blower and duct system, cooled gas being returned to furnace. (3) Fan is installed in furnace chamber, the fan circulating air over charge. This method is adopted particularly to smaller furnaces. VSP (23)

Diffusion of Flame Combustion. H. C. Weller. *Heat Treating & Forging*, Vol. 18, Nov. 1932, pages 649-651; Dec. 1932, pages 701-703, 707. Explains principles of diffusion flame combustion and describes its application to continuous billet heating, boiler-plate heating, hammer forge, box-type slot forge, continuous normalizing and Cu ingot heating furnaces. MS (23)

Water-Cooled Skids in Billet Heating Furnaces. Arthur Sprenger. *Iron Age*, Vol. 129, Mar. 24, 1932, page 725. Abstract translation of article in *Stahl und Eisen*. Describes skid with water-cooled support designed by Friedrick Siemens, A. G., Berlin. See also *Metals & Alloys*, Vol. 3, Jan. 1932, page MA 24. VSP (23)

Continuous Furnaces and Soaking Pits. G. R. McDermott. *Sheet Metal Industries*, Vol. 6, Feb. 1933, pages 625-626; Mar. 1933, pages 695-698; *Iron & Coal Trades Review*, Vol. 126, Jan. 13, 1933, pages 41-43; Jan. 20, 1933, pages 76-78. Discusses recent developments, particularly pressure burners and recuperative methods. Pressure burners afford much more even heating and yield a higher output per unit of fuel. Recuperative pits have shown fuel savings of 25% as compared with regenerative pits. Ha+AWM (23)

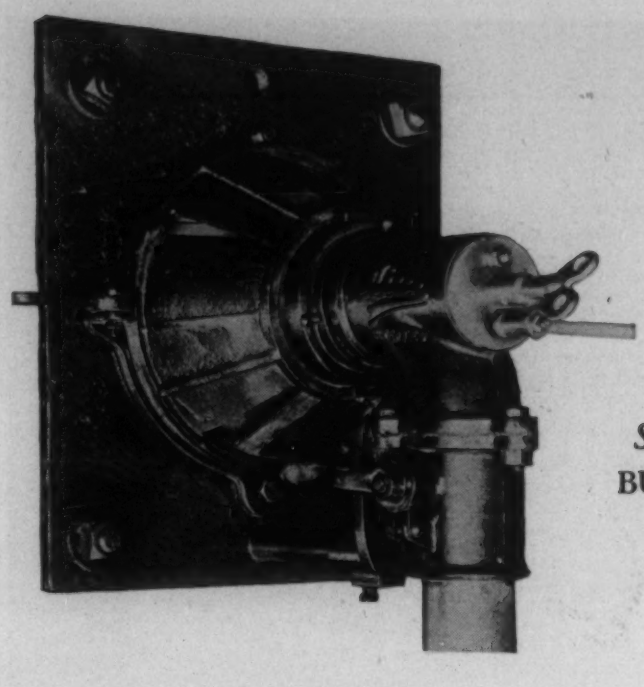
Utilization of Fuels in Metallurgy. (L'utilisation des combustibles en sidérurgie.) A. D. Williams. *Revue de Metallurgie*, Vol. 30, May 1933, pages 222-225. Heat balance of a ton of coal in steel manufacture. JDG (23)

Simple Method for Testing Foundry Coke. (Einfaches Verfahren zur Schmelzkoksprüfung.) *Zeitschrift für die gesamte Giessereipraxis*, Vol. 54, Feb. 5, 1933, pages 49-50. Properties which good foundry coke should have are discussed. Necessity of testing the density is stressed and a simple method is described for determining pore volume. GN (23)

Study of Fuel and Electric Furnaces. Wirt S. Scott. *Electric Light & Power*, Vol. 11, Jan. 1933, pages 36-38; Feb. 1933, pages 33-36; Mar. 1933, pages 33-34, 36, 38; Apr. 1933, pages 46-48; May 1933, pages 38, 40-41. Gives details of tests carried out on a number of gas and electric furnaces used for heat treatment of metals, with particular reference to uniformity of temperature distribution within charge. Results show superiority of electric furnace. Discusses reasons therefor. MS (23)

Electric Furnaces or Fuel Furnaces? (Fours Électriques ou Fours a Combustible.) Carlo Sonnino. *Bulletin de l'Association Technique de Fonderie*, Vol. 16, Sept. 1932 (supplement), pages 12-17. Italian exchange paper presented at World Foundry Congress, Paris, 1932. In melting Al and its alloys, cheapness of melting in fuel furnaces is overbalanced by temperature control, inert atmosphere, purification, and low melting loss of electric furnace. Fuel furnace is best for first melting or preparation of hardeners. WHS (23)

Role of Moissan in Development of Industries Based on Electric Furnace. (Le Role de Moissan dans le Développement des Industries du Four Electrique.) G. Flusin. *Chimie et Industrie*, Vol. 27, Special Number, Mar. 1932, pages 113-119. General and complete review given as address before the Eleventh Congrés de Chimie Industrielle, 1931. MAB (23)



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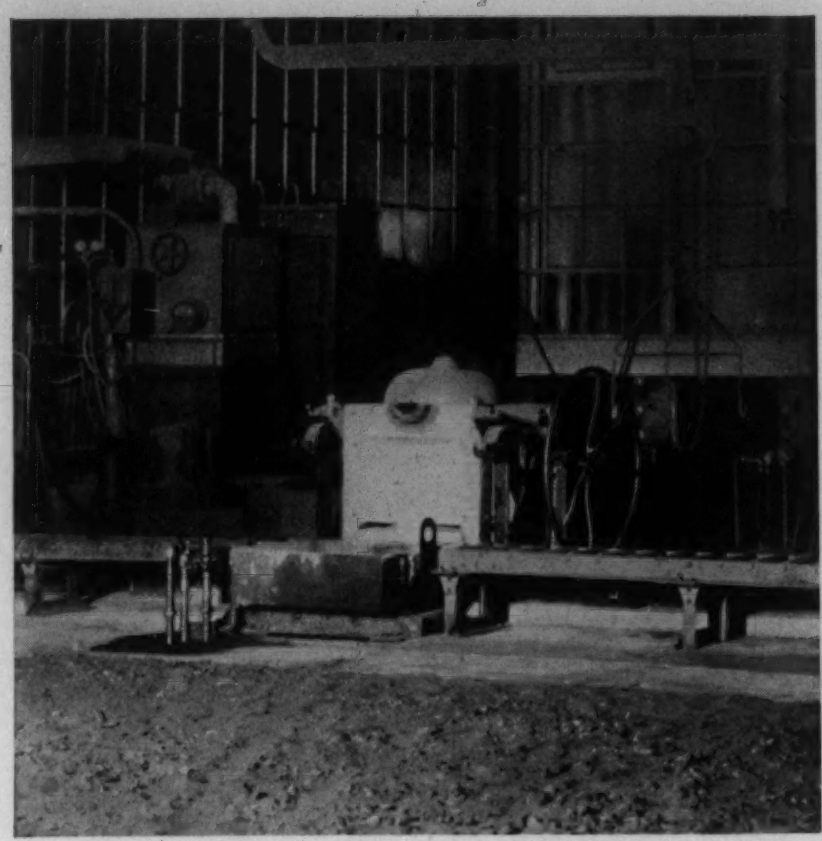

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NORTON REFRACTORIES

REFRACTORIES & FURNACE MATERIALS (24)

Choosing a Good Refractory. L. H. Morrison. *Mill & Factory Illustrated*, Jan. 1933, pages 51-52, 64. Outlines differences between various firebricks and advantages of several high-temperature cements now applied in monolithic form. Materials used for manufacture of bricks, their properties and behavior during service, and repair of furnace walls are discussed. Kz (24)

Applications of Dolomite. (Verwendungsgebiete von Dolomit.) W. Moritz. *Tonindustriezeitung*, Vol. 57, Apr. 27, 1933, pages 393-394. Among the various applications mentioned of interest to the metallurgist is the use as flux material in the blast furnace, as sintered dolomite to be used for lining of metallurgical melting furnaces or in individual cases for lining shaft furnaces. GN (24)

The Use of Shaped Carbons for Lining Melting and Reduction Electric Furnaces. (L'emploi des charbons faconnés pour le revetement de fours électriques de fusion et de réduction.) C. Kuhlmann. *Journal du Four Electrique*, Vol. 42, Aug. 1933, pages 289-291. Tamped and burned-in linings crack and peel. Use of prepared carbon shapes prevents these troubles. JDG (24)

Refractory Lining of the Cupola. (Le Revetement Réfractaire du Cubilot.) L. Longchambon. *Bulletin de l'Association Technique de Fonderie*, Vol. 7, July 1933, pages 253-258. The base material for cupola linings should be previously burned above the transition point. Both quartz and SiO_2-Al_2O_3 compounds undergo transitions around 950°C. Highly silicious material bonded with clay and organic binder or highly aluminous material bonded with clay make satisfactory linings. Materials containing around 12½% Al_2O_3 and the remainder SiO_2 have low fusion points. WHS (24)

Sidelights on Refractories. R. Percival & A. McKendrick. *Transactions Ceramic Society*, Vol. 32, Apr. 1932, pages 167-184. Question of cost of refractories is considered from point of view of open-hearth furnace for reason that larger savings in refractories can be effected in a melting shop than in other departments. Cost of bricks and brick-laying is 17% of total melting cost. At one of most modern open hearth in the Ruhr (Germany) district the average use of refractories over a period of 2 years was represented by the following figures: furnace refractories including landers and doors, 20 lbs./ton steel; ladle refractories, 15 lb./ton steel; while in England these figures were: furnace refractories, 55 lbs./ton steel; ladle refractories, 15 lbs./ton steel. After a considerable amount of experimenting, chrome brick was selected as most suitable material for making gas slopes, and a paste consisting of chrome ore and magnesite as most suitable medium for keeping slopes in repair. GTM (24)

Refractory Linings for Modern Blast Furnaces. Maurice Barrett. *Blast Furnace & Steel Plant*, Vol. 21, Feb. 1933, pages 123-124. From *Chemistry & Industry*. See *Metals & Alloys*, Vol. 4, July 1933, page MA233. MS (24)

Insulation of Open Hearth Furnaces Concerns the Refractories Man. E. F. Entwisle. *Brick & Clay Record*, Vol. 83, July 1933, pages 17-18, 28. When a furnace is insulated the same temperature is maintained with less fuel input per unit of time or higher temperatures are obtained with the same fuel input per unit of time. Until some economical refractory material is developed with safe working temperatures in excess of that of silica brick, attention must be centered on the first of the two possibilities. Tests have shown that insulated silica brick will be destroyed more rapidly than uninsulated brick unless careful temperature control is exercised. With reduced fuel input flame control is important. When proper precautions are observed, a saving of 8-10% of the fuel input is effected in lowering the radiation loss. CBJ (24)

Use of Unburnt Bricks for the Lining of Induction Furnaces. J. H. Chester. *Transactions Ceramic Society*, Vol. 31, July 1932, pages 243-252. Method of lining an induction furnace with tongued and grooved unburnt bricks, the lining being sintered, without the aid of a metal former, by the melting of the first charge is described. GTM (24)

Porous Plastic Made by Use of Calcium Alloys. C. C. Downie. *Metal Progress*, Vol. 24, Aug. 1933, pages 46, 48. The use of the affinity of Ca for O_2 has been used by the author to produce experimentally porous refractory materials at present produced by firing refractory clay bodies containing ground cork. WLC (24)

Refractories for Crucibles. (Feuerfeste Materialien für Schmelztiegel.) *Die Metallbörse*, Vol. 22, Nov. 19, 1932, pages 1486-1487. (1) Al_2O_3: m.p. = 2050°C. resistant to reducing gases, acids, alkalies and temperature changes, shows great electric resistance, very suitable for readily oxidizing metals. (2) Spinel: m.p. = 2135°C., low thermal conductivity, less strong than (1) but equally chemically resistant particularly adapted for rare and semi-rare metals. (3) Be oxide: m.p. = 2500°C., favorable thermal conductivity, insensitive to alkaline melts and reducing materials, but attacked by acid material. Best suited for metals of high melting point, and applicable to all kinds of metals. (4) Zr oxide: m.p. = 2700°C. can be used up to 2500°C., highly resistant to alkaline earths and acid reagents, large coefficient of expansion, but low heat conductivity, sensitive towards temperature changes. (5) MgO: m.p. = 2800°C., large coefficient of expansion and high thermal conductivity, very resistant to basic corrosion attack, tends to volatilize in the presence of C and in reducing atmospheres; can be utilized up to 2500°C. in neutral and oxidizing atmospheres. (6) Th oxide: has highest refractory m.p. of 3000°C., application range and chemical behavior similar to (5), but less sensitive to temperature changes. EF (24)

Brick Lining for Forge Furnaces. C. P. Blair & C. E. Pond. *Metal Progress*, Vol. 23, Jan. 1933, page 49. Clay brick lining instead of silica brick was used in the forge furnace described in the article by the writers in Dec. *Metal Progress*. High coefficient of expansion of silica brick was the reason for using clay brick. WLC (24)

Possibilities of the Use of Siemensite in the Chemical Industry. (Anwendungsmöglichkeiten von Siemensit in der chemischen Technik.) Justus Schmauser. *Die Chemische Fabrik*, Vol. 6, Mar. 15, 1933, pages 119-122. Siemensite is a refractory obtained from the slag from melting low C ferro-chrome. It consists of 20-40% CrO_3, 18-30% MgO, 25-40% Al_2O_3 and 8-14% other materials. Its melting point is over 2000°C. It has good elasticity and heat conductivity and does not soften at high temperatures. Between 900 and 1000° it is sensitive to volume changes. It has been used successfully in contact with basic and acid open hearth, slags, brown coal ash, alkaline glass, water glass, Na_2SO_4, lime cement, and in other chemical industry furnaces. CEM (24)

Blast Furnace Linings. W. J. Rees. *Blast Furnace & Steel Plant*, Vol. 20, Sept. 1932, page 736; Oct. 1932, page 794; *Transactions Ceramic Society*, Vol. 31, Sept. 1932, pages 317-324. Main factors affecting deterioration of blast furnace linings as suggested by investigations carried out during past 12 years at Sheffield University are enumerated. Results of these tests indicate that aluminous bricks are more resistant both to slag corrosion and to corrosion by absorbed alkalies than silicious bricks. In these tests, high-silica (95%) bricks were almost as resistant as aluminous bricks (37% Al_2O_3). Observations on many linings indicate necessity of distinguishing between porosity and permeability. For upper parts of furnace mechanical strength as measured by a cold-crushing test appears to give indications of greater value than the test of "refractoriness under load." There is some suggestion from experiments on C deposition that ferrous Fe compounds are more likely to promote C deposition than ferric Fe compounds. Laboratory tests indicate that thoroughly burned bricks are less susceptible to deterioration from storage in the open air than inadequately burned bricks. See also *Metals & Alloys*, Vol. 4, Feb. 1933, page MA55. MS + GTM (24)

EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

Creep of Steel at High Temperature. (Das Kriechen des Stahls bei hohen Temperaturen.) A. Thum & H. Holdt. *Zeitschrift Verein deutscher Ingenieure,* Vol. 76, Nov. 26, 1932, page 1172. Steel begins to creep at temperatures above 300° C. under stationary steady load and at stresses which may be considerably below the elastic limit. For this reason it is not permissible to assume the admissible stresses for higher temperatures from the usual hot tensile test but from the creep stress. Tests made with different steels showed that other laws must be applied for hot tensile strength of steels than for the strength at room temperature. Increase of alloying metals can sometimes lower the creep strength. A favorable effect is exerted by Cr, Mo, and W. Character of structure is of special importance; streaky pearlite is considerably better for the creep strength than spherical cementite, and even a coarse casting structure gave good values. It was surprising to find that at places of highest stress in a machine part as in notches, section transitions, holes, etc., the material creeps less due to impeded deformation by the adjacent, less stressed part. Additional alternating stresses did not influence creep. Full development of creep requires some time. Ha (29)

Thermal Expansion of Lead. P. Hidnert & W. T. Sweeney. *Metal Industry,* London, Vol. 42, Feb. 10, 1933, pages 177-178. Linear thermal expansion of Pb was measured on 3 samples between — 250° and + 300° C. From — 250° to + 20° C. the coefficient is 25.1 × 10^{-6}, from 20° to 300° C. 31.3 × 10^{-6}; other values for intermediary ranges are given. Ha (29)

Stresses on Boiler Tubes Subjected to High Rates of Heat Absorption. Wm. L. Debaufre. *Combustion,* Vol. 4, Feb. 1933, pages 9-16. Points out salient matters contained in a contribution of Technical Research Department of International Combustion Engineering Corp., originally having been presented at the annual meeting of the A. S. M. E., Dec. 1932. Detailed discussion and derivation of various formulae are omitted. Calculations made in investigation were based on as nearly accurate experimental data as could be found for mild steel used in boiler tubes. Results indicate that safest thickness of tube wall is that thickness where ratio of proportional limit stress to internal-pressure test is a maximum. Tests of 3" o.d. tubes of wall thickness from ⅛" to ⅝" under an internal steam pressure of 1390 lbs. gage and at various heat absorption rates indicated in all cases that the safest ratio is for a greater thickness of tube wall, certainly not a thinner one, than specified by the A. S. M. E. DTR (29)

The Hardness of Metals at High Temperatures. *Engineering,* Vol. 134, Nov. 18, 1932, pages 604-605. J. Ferdinand Kayser of Messrs. Darwin, Ltd., Sheffield, has developed a method for determining true hardness of metals at high temperatures which enables the results to be expressed as Brinell hardness numbers. The sample, in the form of a cone having an included angle of 120°, rests on an anvil and is subjected to a load of 35 kg. for 10 days. The anvil, cone and plunger are surrounded by a furnace which can be maintained at any temperature up to 1150° C. The pressure per mm.^{2} on the flat surface formed on the cone is in close agreement with the Brinell number determined by the ordinary method. LFM (29)

Creep Tests on Cold-Drawn Bridge Wires. *Iron Age,* Vol. 129, Apr. 21, 1932, page 915, adv. sec. page 20. Gives additional data to that published in *Iron Age,* July 3, 1930. Discusses results of tests made at Lehigh University to determine creep of cold drawn bridge wire under varying conditions. VSP (29)

The Characteristics of Deformation of Steel Under Constant Load at Elevated Temperatures. G. R. Brophy. *Transactions American Society for Steel Treating,* Vol. 20, July 1932, pages 58-72. Previously abstracted as Preprint No. 4, 1931. See *Metals & Alloys,* Vol. 3, Mar. 1932, page MA 82. WLC (29)

Design of Heat Resisting Castings. Ralf S. Cochran. *Metal Progress,* Vol. 22, Oct. 1932, pages 45-49. Abstract of a paper for the Buffalo Convention, A.S.S.T., Oct. 1932. The development of walking beam conveyors for furnaces is described. The qualities and specifications of the beams used are given. Creep and friction in heat resisting castings are discussed. The sliding of one member on another is found practicable in heat resistant alloy parts as the high spots are work hardened to a hard finish. Composition of alloys for high temperature work varies, but a few basic formulas are given. Castings as thin as can be soundly cast are specified. A continuous walking beam conveyor furnace is described with a diagram and illustrations. Coefficient of friction test results are tabulated for alloy on alloy and steel on alloy at low and high temperatures. The importance of design in alloy castings is stressed. WLC (29)

Certain Irregularities in Stress-Strain Curves of Steel Treated at High Temperatures. (Sur certaines singularités des courbes de traction des aciers à chaud.) Jean Galibourg. *Comptes Rendus,* Vol. 195, Dec. 5, 1932, pages 1072-1074. Summarizes previous work on (1) existence of minima and maxima in values of breaking stress as temperature rises, (2) progressive decrease in elastic limit with rise of temperature, and (3) effect of aging which produces oscillations of large amplitude in stress-strain curve, and then discusses it with view of showing that all effects observed can be referred to aging which occurs more or less rapidly at various temperatures. He refers to his previous results, *Comptes Rendus.* Vol. 195, 1932, page 1022. OWE (29)

With ever increasing temperatures and pressures==what?

These abstracts are prepared in cooperation with the Joint High Temperature Committee of the A. S. M. E. and the A. S. T. M.

Internal Combustion Engine Exhaust Valve Failures. C. C. Hodgson. *Iron & Steel Institute, Advance Copy* No. 5, May 1933, 15 pages. Common types of failure of exhaust valves are discussed. The appearance of broken valves suggests that breakage is the result of corrosion fatigue. Burning and cracking of valves at their edges are initially caused by small leakage of gas during the combustion cycle. The best steels available will not withstand the most severe service. Leakage past closed valves may be started by valves picking up portions of the seat. Alloys used for seats are discussed. Stellite and Mackalloy are used because of their hardness at high temperatures. 18 references. JLG (29)

On the Creep of Steel at Elevated Temperatures. Atsumaro Shimidzu. *Journal Society of Mechanical Engineers,* Tokyo, Vol. 35, Dec. 1932, pages 1174-1179. Paper read before 217th Meeting, Society of Mechanical Engineers, June 29, 1932. In the introduction is a supplementary discussion of a paper "On the Creep of Steel at Elevated Temperatures" by the same author (*Journal Society of Mechanical Engineers,* Tokyo, Vol. 33, June 1930, pages 72-79). Creep curve consists of 2 parts: (1) covering the decreasing deformation-speed due to the strain-hardening effect, (2) relating to the increasing deformation-speed due to a slight increase of actual stress owing to the progress of deformation and to the fact that the hardening does not increase beyond some definite degree. Microstructural analysis of the internal mechanism of the crystal deformation during both periods involves relations between grain boundaries, grain deformation and strain-lines. Tests are carried out with C steel and Ni-Cr steel. Kz (29)

AMALGAMATION, CYANIDATION & LEACHING (30)

A Research on Location and Constitution of Residual Gold after Cyaniding. J. R. Thurlow. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, June 1932, pages 311-322. Intensive cyanidation of 2 sand residues reduced Au from 0.465 to 0.295 dwt. and from 0.705 to 0.430 dwt./ton. The final Au content is encased in pyrite and quartz. Aqua regia extraction showed 89.5% and 77.2% of the Au in these 2 residues was in the pyrite. Pyrite content is 1.949% and 1.952%. Pyrite encased Au is 13.55 and 17.01 dwt./ton of pyrite; in the -200 mesh portion it is 5.9 and 6.3 dwt. Selective grinding to -200 mesh would give a theoretical recovery of 47.5% and 49% of the Au in the residues. Bulk grinding would give an extra 0.02 and 0.086 dwt. In discussion, H. A. White insists the evidence shows the bulk of the Au is on the quartz-pyrite interface. F. Wartenweiler supports Thurlow and mentions a siliceous network often associated with pyrite to which Au adheres. AHE (30)

The Cyaniding of Tailings. *Chemical Engineering & Mining Review,* Vol. 24, Aug. 5, 1932, pages 375-377. A brief outline is given of the operation of a cyanide plant with a capacity of 400 tons of tailings per month. WHB (30)

The Treatment of Hollinger Precipitate to Produce Fine Gold. Matthew Scott. *Transactions Canadian Institute of Mining & Metallurgy,* 1931, pages 228-238. See *Metals & Alloys,* Vol. 2, July 1931, page 139. AHE (30)

Ammonia Leaching of Cupriferous Sandstones. N. P. Aseev, K. F. Beloglasov & N. S. Greiver. *Tzvetnuie Metallui,* No. 6, June 1931, pages 703-712. Results of experimental ammonia leaching of sandstones containing 1.3 to 1.8% Cu occurring in the Ural district are given. The recovery is lower than that obtained by H_2SO_4 method. BND (30)

Hydrometallurgical Acid Treatment of Carbonate Ores. N. P. Aseev, K. F. Beloglazov & N. S. Greiver. *Tzvetnuie Metallui,* No. 5, May 1931, pages 570-581. The results of an extensive investigation of the solution of marble, calcite and limestone in H_2SO_4 of varying concentrations may be summarized as follows: (1) Formation of films of $CaSO_4$ leads to a sharply defined reduction in the speed of reaction of $CaCO_3$ at a concentration of about 2% H_2SO_4. (2) The thickness of the affected layer of carbonate depends on the concentration of the solution but for concentrations employed in practice does not depend on the size of the material. The degree of crushing, therefore, has a great influence on the reagent consumption. (3) The results obtained give very important indications regarding their application to practical processes of extracting metals from carbonates or any other material whereby the acid or any other reagent forms an insoluble film on the ore. Experimental procedure and data are given. BND (30)

Milling at Pioneer Gold Mines. Harry J. Cain & Paul Schutz. *Canadian Mining & Metallurgical Bulletin,* No. 248, Dec. 1932, pages 714-723. Ore consists chiefly of quartz carrying free Au with small amounts of pyrite, arsenopyrite and pyrrhotite. Cyanide plant is described. AHE (30)

Composition of Copper Matte. C. K. Avetissian. *Engineering & Mining Journal,* Vol. 133, Dec. 1932, pages 627-629; Vol. 134, Jan. 1933, pages 27-28. Solubility at room temperature of Cu, CuS, Cu_2O, CuO, Cu-ferrite, chalcopyrite, FeS_2 and Fe_2O_3 in 7% KCN solution was measured in an atmosphere of H. Cu and all its compounds, with exception of $CuFeS_2$ and $CuO\text{-}Fe_2O_3$ are completely soluble in cyanide, while Fe and its compounds are insoluble. Part II. A study of composition of Cu-matte leads to following conclusions: (1) only stable compound formed by reaction between Cu_2S and FeS, soluble in KCN; (2) all cu-matte contains this compound; (3) cooling matte, depending upon rate at which it proceeds, causes precipitation of metallic Cu, soluble in KCN; at same time insoluble sulphides are formed higher in S than FeS, including $CuFeS_2$; (4) when matte and sulphide are dissolved in KCN, S dissolves as sulphide and as sulphocyanide; (5) Hampe's method for determining O by reduction with H gives too high results on account of reducible and volatile elements difficult to identify, such as Zn, Sb, and As. 16 references. WHB (30)

A Review of De-aeration of Cyanide Solution. F. Wartenweiler. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 32, Feb. 1932, pages 139-146; discussion, Mar. 1932, pages 216-218; Apr. 1932, page 256; discussion, June 1932, page 334. O_2 is removed by vacuum; chemical reaction with Fe, Zn, $MnSO_4$, tannin or pyrite; electrolysis; or living organisms. AHE (30)

Cyanidation of Calcined Gold Ores Made Refractory by the Presence of Lead Minerals. Edmund S. Leaver, Jesse A. Woolf & Thomas A. Jackson. *American Institute Mining & Metallurgical Engineers, Contribution* No. 5, Feb. 1933, 15 pages. Studies with synthetic ores showed that alkali-soluble Pb compounds decreased the rate of dissolution of Au by cyanidation. Better extraction was obtained by substituting NaOH or NH_4OH for the CaO, used in obtaining the protective alkalinity, and keeping the pH below 11.0. The harmful effect of Pb is due in part to consumption of O in the solution and can be corrected partly by adding oxidizers such as H_2O_2. If an ore containing free Au and PbS, $PbSO_4$ or PbO with FeS_2 is roasted, a Pb compound coats the Au particles and prevents their solution in cyanide. Removal of most of the soluble Pb compounds by a preliminary treatment with acid-brine solution leaves a residue from which the Au is dissolved readily in a lime-cyanide solution. Tests with natural ores confirmed these tests. 4 references. JLG (30)

Experimental Tests on an Arsenical Gold Ore from the Miller Bay Gold Mines, Ltd., Sudbury District, Ontario. J. S. Godard. *Canada Department Mines, Mines Branch, Report* No. 728, 1932, pages 11-17. An ore analyzing As 29.78%, Fe 27.60%, Ni 0.06%, Pb 0.07%, Zn 0.03%, S 16.7%, insoluble 21.10% and Au 0.85 oz. and Ag 0.08 oz./ton gave recoveries of 87-93.6% of the Au by roasting and cyanidation. Direct cyanidation gave 81.9% recovery. Cyanide and lime consumption are high. H_2O washing of the roasted ore prior to cyanidation gave a slightly improved extraction and greatly lessened cyanide and lime consumption. AHE (30)

A Study of the Effects of Adding Gold Refinery Slags to Raw Gold Ore Treated by Cyanidation and Also Spent Carbide Used as Lime. Alex. K. Anderson. *Canada Department Mines, Mines Branch, Report* No. 728, 1932, pages 17-19. Refinery slag added to ore gave higher grade tailings and increased cyanide consumption. Use of spent carbide has no ill effects on the settling rate, but tailing losses are slightly higher. AHE (30)

Experimental Tests on Gold and Silver-Bearing Ores from the Moss Gold Mines, Limited, Kashabowie, Thunder Bay District, Ontario. J. S. Godard. *Canada Department Mines, Mines Branch, Report* No. 728, 1932, pages 35-43. An ore containing Au 0.24-1.255 and Ag 1.73-9.57 oz./ton, Cu 0.13-0.52%, Pb 0.02-0.75%, Zn 0.19-0.75%, and Te 0.02-0.07% was subjected to amalgamation, concentration and cyanidation tests. The latter is the best method of treatment for this ore. Cyanide consumption is moderate. AHE (30)

Experimental Tests on Gold Ore from the Bralorne Mines, Ltd., Bridge River, Lillooet Mining Division, B. C. J. S. Godard. *Canada Department Mines, Mines Branch, Report* No. 728, 1932, pages 62-68. Two methods were developed for recovering Au from an ore assaying 1.41 oz./ton. Amalgamation followed by concentration of tailings and cyanidation of concentrates gave net recoveries of 92.8%. Amalgamation and cyanidation of tailings gave net recoveries of 93 to 94%. AHE (30)

The Recovery of Gold in Ore from the Leroy Fiedmont Mining Company, Ltd., Township of Louvicourt, Abitibi County, Quebec. Alex. K. Anderson. *Canada Department Mines, Mines Branch, Report* No. 728, 1932, pages 9-11. An ore assaying Au 0.31 oz./ton, ground to —48 mesh, gave a recovery of 58.1% by amalgamation and an additional 22.5% by cyanidation of the tailing. The same overall recovery was obtained by straight cyanidation. At —100 mesh, 97% recovery was obtained and 98.4% at —150 mesh. AHE (30)

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

of METALS & ALLOYS, published monthly at Pittsburgh, Pa., for October, 1933. State of Pennsylvania, County of Allegheny, ss.

Before me, a notary public in and for the State and county of New York, personally appeared Richard Rimbach, who, having been duly sworn according to law, deposes and says that he is the editor of the METALS & ALLOYS and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Chemical Catalog Company, Inc., New York, N. Y.; Editor, Richard Rimbach, New York, N. Y.; Managing Editor, Richard Rimbach, New York, N. Y.; Business Manager, Philip H. Hubbard, New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) The Chemical Catalog Company, Inc., New York, N. Y.; R. W. Reinhold, New York, N. Y.; L. N. Thompson, New York, N. Y.; F. M. Turner, New York, N. Y.

3. That the known bondholders, mortagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

RICHARD RIMBACH, Editor

Sworn to and subscribed before me this 26th day of September, 1933. [Seal] CURVILLE C. ROBINSON, Notary Public (My commission expires March 30, 1934)

NEARLY half the 1600 rooms at the William Penn Hotel have now been reduced to $3.00 and $3.50. A NEW DEAL for everybody! The same excellent service, the same luxurious appointments at Pittsburgh's finest hotel. All rooms with bath . . . Management Eppley Hotels Co.

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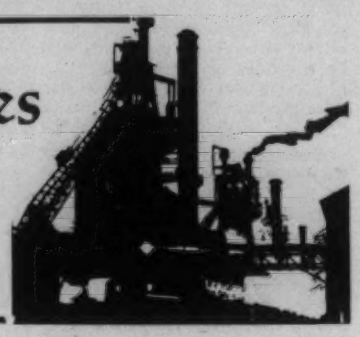
REDUCTION METALLURGY (31)

Valuation of Iron Ores for Blast Furnace. (Beitrag zur Bewertung von Eisenerzen für der Hochofen.) E. Diepschlag, M. Zillgen & H. Poetter. *Stahl und Eisen*, Vol. 52, Nov. 24, 1932, pages 1154-1162. Reducibility of Fe ores was measured with blast furnace gas over entire range of pressure, temperature, and gas velocity existing in blast furnace. Structure and porosity of ores were determined microscopically using integration stage. Investigations of red hematite, limonite and minette showed that relation of degree of reduction to size of pieces was fundamentally same for all ores and is directly related to pore area for each cc. of ore. All ores of a definite small size showed a practically equal maximum value of reducibility by blast furnace gas. This means that reduction curve of an ore in relation to size can be obtained without tedious reduction experiments from physical structure, especially from pore area for each cc. of ore. Saving in coke can be obtained by proper crushing. Preliminary determination of this saving agreed very well with operating results and proved correctness of reduction curves derived experimentally. A suggestion is made for ore valuation so that coke required for a certain reduction process can be determined by ore size. Ha (31)

If You Smelt Ores

Here Are New Ideas for You.



Development of American Sintering Practice. Andersen. *Domez*, No. 8, 1932, pages 16-20. In Russian. A survey of latest developments in sintering practice in U. S. Principally installations of Dwight-Lloyd and Greenawalt are discussed. (31)

Smelting of Ores and Metallurgical Products to Crude Metals, Mattes and Slags. (Ueber das Verschmelzen von Erzen und Hüttenprodukten auf Rohmetalle, Stein und Schlacke.) H. Skappel. Thesis, Freiberg Bergakademie, 1931, 62 pages. Mimeographed. Discussion of smelting by electrolysis of fused silicates between a C anode and a fused metal sulphide cathode, such as FeS. As metal ions are deposited in the sulphide cathode beyond the ability of the S to retain them, the metal may separate in a layer beneath the sulphide, and be tapped off. The reducibility of various metal oxides is considered from the point of view of thermochemistry. The solubility of sulphides in slags of different degrees of acidity and basicity, and the solubility of metals in mattes, are discussed. Metallic sulphides of low heats of formation (those of Ag, Hg, As, Sb, Mo, Ni, Pb, Cu, Co and Fe) act like metals, those of Sn, Cr and Cd, are in between, while those of Al, Zn, Mn, Mg, Na, Ca, Sr, K and Li do not behave like metals. The transfer of the metals of the different groups from oxide or silicate layers into the sulphide layer, and the separation of crude metal from the sulphide layer are studied experimentally and theoretically. HWG (31)

Recent Developments in American Blast-Furnace Design and Practice. Wm. A. Haven. *Iron & Steel Institute, Advance Copy* No. 4, May 1933, 30 pages. Means and methods recently used in America to meet changed conditions of blast-furnace requirements are summarized. Particular attention is given to checkerwork of stoves and to gas cleaning. Increasing diameter of hearth has been conducive to economy. It has been found that furnaces can be run economically under a reduced output. JLG (31)

Centralized Remote Control and Regulation in Blast Furnace Plant. *Iron & Coal Trades Review*, Vol. 125, Sept. 2, 1932, pages 338-340. Layout and wiring diagrams of centralized control of the blast furnace plant of Krupp in Essen-Bergeborbeck is described in detail. Ha (31)

Blast Furnace Signaling Installation for the Control of Uniform Supply of Gas. (Hochofensignalanlage zur Regelung gleichmässiger Gasentnahme.) E. Kock. *Siemens-Zeitschrift;* Vol. 12, Aug. 1932, pages 276-279. The gas cleaning station of a large plant is equipped with a signal system which indicates to all blast-furnace gas-consuming departments the momentary availability of gas, so that their consumption can be regulated accordingly. The remote indicating apparatus is described briefly. Ha (31)

Burning of Blast Furnace Tuyeres and Its Prevention. Z. I. Nekrassov. *Domez*, No. 8, 1932, pages 46-65 (In Russian). Average life of forged Cu tuyeres in the 3 plants investigated was 1447, 493 and 228 hours respectively. Burning was always caused by liquid Fe collecting on tuyeres. The distribution of the cooling water in tuyeres was studied by using colored liquids in a glass model of the tuyere. Best distribution was obtained by placing at 70 mm. from the tuyere nozzle a pipe with 2 rows of perforations, the first perpendicular to the walls of the tuyere and the second perpendicular to its face. Four different methods of water inlet were studied. A tuyere with its nozzle cut at an angle to its axis was proposed for elimination of burning. (31)

The External Heat Loss of a Blast-Furnace. D. F. Marshall. *Iron & Steel Institute, Advance Copy* No. 8, May 1933, 18 pages. Heat losses through the shell, the cooling water, and the ground were estimated from a series of temperature measurements. Most of the values used in the calculations were averages of readings obtained over a period of days. The shell of the shaft was 53 ft. high, and 18½ ft. and 25¼ ft. in diameter at the top and bottom respectively. The average temperature of the shell was 133.7° F. That of the air was 49.2° F. Radiation loss calculated by the T4 law using these temperatures was 336,800 B.t.u./hr. Convection loss was calculated on several assumptions and an intermediate value of 305,200 B.t.u./hr. selected. The bosh was sprayed with cooling water, and there were 8 water-cooled tuyeres. The inlet and outlet temperatures of the water were measured and the rate of flow of the water determined. Using these values, the heat carried away by the water was found to be 4,005,000 B.t.u./hr. Temperature gradients were measured in materials on which the furnace was set. They indicated that the heat loss to the ground was 159,600 B.t.u./hr. Fe was produced at the rate of 10,000 lb./hr. The total heat loss was 480 B.t.u./lb. of Fe (earlier estimates were from 790 to 1725 B.t.u./lb. of Fe). Previous workers probably overestimated the rate of heat flow to the ground. 15 references. JLG (31)

Beryllium Metal From the Oxide. G. D. Fitzpatrick. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Apr. 22, 1932, page 403. Description of some laboratory-scale experiments on reduction of BeO with powdered Al. Some BaO_2 was added to mixture as a source of internal heat and Na_2BeF_4 or Na_3AlF_6 was added as fluxing agent. Yields are given. JN (31)

Experiments on Texada Island Magnetite. *Iron & Steel of Canada*, Vol. 15, Sept. 1932, page 107. This ore (typical composition given before and after magnetic concentration) has been put through a complete experimental steel-making process by sponge Fe method. Results are considered favorable for commercial development. OWE (31)

The Semi-Direct Production of Nickel Steel from Sudbury Ore. T. W. Hardy & H. H. Bleakney. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 164-177. See *Metals & Alloys*, Vol. 4, Mar. 1933, page MA 91. AHE (31)

Broken Hill Mining Field. *Proceedings Australasian Institute Mining & Metallurgy*, No. 87, Sept. 30, 1932, pages lxi-cxiii. Ore treatment methods in Broken Hill field are considered in general and briefly for each mine. AHE (31)

Description of Continuous Lead Refinery at the Works of the Broken Hill Associated Smelters Proprietary Limited, Port Pirie, South Australia. G. K. Williams. *Proceedings Australasian Institute Mining & Metallurgy*, No. 87, Sept. 30, 1932, pages 75-133. As and Sb are first removed, then Cu and Au, then Ag and finally Zn, all by a continuous process. The development of these processes is described in great detail. Metallurgical efficiencies are much higher using the continuous process than the batch, the treatment rate is higher, fuel consumption is lower, labor costs and maintenance costs are less, and the flexibility is increased. The new refinery is described. AHE (31)

The Broken Hill Associated Smelters Proprietary Limited, Port Pirie, S. A. Brief Outline of Lead Smelting Operating Procedure. *Proceedings Australasian Institute Mining & Metallurgy*, No. 87, Sept. 30, 1932, pages cxiii-cxxxv. Smelting at Port Pirie is considered in detail. Galena is roasted on Dwight-Lloyd sintering machines, the sinter is smelted and the resulting base bullion is refined. Analyses of gases, slags and products from various steps are given. AHE (31)

The Recovery of Zinc and Lead from Blast Furnace Slag at Trail, B. C. G. E. Murray. *Transactions Canadian Institute Mining & Metallurgy*, 1933 (in *Canadian Mining and Metallurgy Bulletin* No. 252) Apr. 1933, pages 75-103. Molten Pb-blast furnace slag analyzing Pb 3.6, Zn 17.6, SiO_2 19.4, Fe 29.3, CaO 8.4, Al_2O_3 3.9% and Ag 0.13 oz./ton, is placed in a special furnace and powdered coal blown in through the tuyeres. Zn left in the slag is a function of blowing time. Pb is reduced to 0.05 and Zn to 3.5% using about 25% of coal. The dust collected in the economizer averages Pb 14.8, Zn 61.4% and Ag 0.40 oz./ton. The baghouse fume contains Pb 10.4, Zn 67.3% and Ag 0.30 oz./ton. Dust in the waste heat boilers assays Pb 19.3, Zn 50.6% and Ag 0.60 oz./ton. About 100 tons/day of dust and fume are collected. Using this process, less care is necessary in the Pb smelting; less coke can be used in the blast furnace, less flux is required (more furnace space for Pb charge) the furnace runs faster and smoother (less labor), and combined recoveries are greater. AHE (31)

Zinc Oxide from Calamine Residues. *Chemical Trade Journal & Chemical Engineer*, Vol. 90, Apr. 29, 1932, page 427. A description of the new Zn oxide plant erected at Moresnet for the extraction of Zn from low grade calamine residues containing 10-13% Zn. These are mixed with coke dust and passed through an inclined, rotating, cylindrical furnace. The metal is liberated at 1250° C. and immediately oxidized to ZnO. This dust is recovered by electrical precipitation. About 130 tons of residue are treated per 24 hrs. From 85 to 90% of the Zn is recovered as ZnO containing 60% Zn. JN (31)

Development of Metal Volatilization Processes in Rotary Furnaces During the Last Three Years. (Die Entwicklung der Metallverflüchtigungsverfahren im Drehrohofen in den vergangenen drei Jahren.) Otto Barth. *Metall und Erz*, Vol. 30, Jan. 1933, pages 1-5, 24-30. A description of 4 processes, including equipment and reactions, the Follsain, Wigton, Coley, and Wälz. The Wälz process is considered the most important and is described in greater detail. Flow sheets are included. 25 references. CEM (31)

Single Step Blast Roasting of Zinc-blende. (Das einstufige Verblaserösten von Zinkblende.) Brenthel. *Metall und Erz*, Vol. 30, Feb. 1933, pages 61-68. Present status of Zn-blende roasting is discussed, including powder roasting, dross roasting, and two step and single step blast roasting, their theory, practice and production costs. The roasting loss is about 2%. The product is porous and is ideal for the muffle reducing process as the ZnO and CO can come into more intimate contact. Lower reducing temperatures, in one case 120° C. lower, can be used. CEM (31)

Dehydration of Bauxites and Bauxite Minerals. (Die Dehydratisation der Bauxite und Bauxitmineralien.) J. Györki. *Aluminium*, Vol. 14, Oct. 31, 1932, pages 3-5; Nov. 15, 1932, pages 3-6. Composition of Al minerals is studied, especially temperatures at which hydrates are separated. Heating and dehydration curves were determined for hydrargitite ($Al_2O_3 \cdot H_2O$) diaspore (essentially 85.12% Al_2O_3, 14.88% H_2O) and limonite (varying compositions of Fe_2O_3, H_2O, Mn_2O_3 and SiO_2.) Method of dehydration is described. Ha (31)

Nephelite as a Raw Material for Production of Aluminum. (Nephelin als Rohstoff zur Aluminiumfabrikation.) Friedrich Vogel. *Chemiker-Zeitung*, Vol. 57, Feb. 8, 1933, pages 101-103. Under existing conditions, treatment of nephelite syenites with HNO_3, H_2SO_3, H_2SO_4, HCl or conversion into a Ca slag are not economical means for extraction of Al_2O_3 in Russia. The ores are of 3 classes: Those mostly soluble in acids, those partly soluble in acids, and those containing minerals such as Be and Zr. HF dissolution is most suited to these conditions. Its advantages include: Rare earths form double fluorides soluble in H_2O; the reactions take place at low temperatures, 300°-400° C., Al and Fe can be separated by the difference in solubility of their fluorides in H_2O, Na and K salts can be separated from residual solutions and impurities can be used. SiO_2 can be recovered as H_2SiF_6 or H_2SiO_3 and Na_2SiF_6 obtained. If the nephelite were pure, the Blanc process could be used. CEM (31)

Smelting Complex Tin Residues in the Blast Furnace. *Journal Society of Chemical Industry*, Vol. 51, Aug. 26, 1932, pages 715-717. Installation is described capable of smelting very wide range of Sn-bearing residues from great variety of sources. Sn containing very considerable proportion of Cu must be worked by another system. Besides Sn the residues may contain Sb, Pb, Fe, Ni, Zn and small percentages of Cu. They are composed chiefly of following: solder ashes, white metal drosses, babbit ashes, pewter skimmings, Sn scruff, Sn plate and ternplate ashes, capsule dross, antifriction and britannia metal skimmings, Sn sludges from chemical works, matte holding Sn, and greases and pastes containing Sn. VVK (31)

Coke Consumption in Blast-Furnace Practice: The Effect of Removal of Breeze. D. F. Marshall & R. V. Wheeler. *Iron & Steel Institute, Advance Copy* No. 9, May 1933, 27 pages. The furnace was run and the daily performance analyzed for several weeks using a rather soft coke from which the fines were removed by passing over bars set ¾, 1¼, or 1½ in. apart. Removing the breeze caused the furnace to drive more easily. About 9% of breeze was removed with the 1¼" aperture. The most desirable coke for blast furnaces should be less than 3" and more than 1¼" or 1" in diameter when it arrives at the stock level. JLG (31)

Action of Zinc in Blast Furnaces. *Foundry Trade Journal*, Vol. 48, Feb. 16. 1933, page 123. Summary of action of Zn in increasing coke consumption. causing scale-formation on lining, contaminating metal, etc. Physical properties of Fe produced are affected adversely, although its composition is not changed appreciably. Analyses of linings destroyed by the action of Zn are given. OWE (31)

Direct Production of Molten Steel from Ores. E. A. Milayev. *Domez*, No. 10, 1932, pages 21-27. (In Russian.) A method is proposed for direct production of Fe from ores. The ore is charged in an electric furnace of arc type. Only sufficient C to accomplish reduction is blown into the arc zone through a hollow electrode. (31)

NON-METALLIC COATINGS FOR METALS & ALLOYS (32)

Manufacturing Enameled Sanitary Ware. Louis Wolff. *Better Enameling,* Vol. 4, Feb. 1933, pages 13-14; Mar. 1933, pages 11-12; Apr. 1933, page 18. Foundry and enameling practices for dry process enameling are described along with discussion of specific shop problems. Fe mixtures are carefully considered as they must be economical in price, pour properly in thin wall castings, and be close grained and free from slag pits and blow-holes. Si, P, and S contents are important. Application of acid resisting enamel is discussed. CBJ (32)

Anode Process for Rubber Articles and Coatings. C. L. Beal. *Industrial & Engineering Chemistry,* Vol. 25, June 1933, pages 609-613. By this anode process articles of countless shapes and sizes can be efficiently and inexpensively covered with adherent coatings of soft and hard rubber. A high degree of adhesion to metal and many types of non-metal surfaces can be obtained through use of Vulcalock (a rubber isomer of remarkable adhesive properties) which can be applied to articles by anode process deposition from water dispersions or by dipping in solvent solutions. These coatings are used as resistance to corrosion, wear and abrasion, insulation against electricity, heat, sound, and vibration. MEH (32)

Reducing the Fouling of Ships' Bottoms. *Marine Engineering & Shipping Age,* Vol. 37, Mar. 1932, page 102. Examinations of vessels and experiments with submerged plates painted in different colors show that light-colored paints resist fouling better than dark ones. Kz (32)

Information on Paints. (Vertiefte Erkenntnis über Anstrichstoffe.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 22, Nov. 27, 1932, pages 630-631. Gives an account of papers before the meeting on "Anstrichtechnik" of the Verein deutscher Chemiker and Verein deutscher Ingenieure, Oct. 1932, Berlin. The factors affecting the variable durability for rust prevention of paints of the same composition are particularly referred to. In general, the methods of valuating paints (abbreviated testing methods) are not yet satisfactory and reliable research in the last few years elucidated the criteria which are of prime importance for durability and protective action. These are capacity of water absorption and density. Various types of artificial and natural rust preventing paints are discussed with special reference to rapid lacquering methods, i.e. time and material saving paints. GN (32)

German Research Work on Corrosion. *Steam Engineer,* Vol. 2, Mar. 1933, page 273. The best formulas for red Pb paint for structural steel are discussed. AHE (32)

Method of Processing Lacquer Coatings on Metal Foils for Packing Materials. (Verfahren zur Herstellung eines Lacküberzüges auf Metallfollen für Verpackungszwecke.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, May 28, 1933, page 308. Brief description of the new method based on Swiss patent No. 151,978. The metal foils are thinly coated with phenol formaldehyde then pre-hardened for 30 sec. on a heated drum at about 130°-145° C. and finally hardened for 3-4 hrs. in coiled shape in a furnace at temperatures not higher than 130° C. Such coatings are very elastic and do not discolor. GN (32)

Thinly Flowing Aluminum. (Dünnflüssiges Aluminium.) *Aluminium,* Vol. 14. Oct. 15, 1932, page 6. "Storal" gives a highly light-reflecting coating to walls, surfaces, etc. and is at the same time corrosion resisting; heat radiation is very low so that it can be used as heat insulator for pipes, etc. Substance consists of Al flakes with a binder, and is said to have good mechanical properties. Ha (32)

Paint Coats on Aluminum Alloys. (Farbanstriche auf Aluminiumlegierungen.) *Aluminium,* Vol. 14, Dec. 15, 1932, pages 1-3. Preparation of surfaces and technique of putting on paints with and without pigment on light metals are briefly discussed, and a tabulation of paints, their composition, manner of application (sprayed on or by brush), method and length of time of drying, and of the manufacturers is added. Ha (32)

The Technique of Vitreous Enamelling. J. E. Hansen. *Sheet Metal Industries,* Vol. 6, Nov. 1932, page 448; Vol. 6, Dec. 1932, pages 520-522; Jan. 1933, pages 591-593; Mar. 1933, pages 749-750; Vol. 7, May 1933, page 39. Short discussion on care of graining plates and rolls. Application of stencilled designs and decalcomanias is discussed together with some shop troubles such as blistering and fish scaling. Enamel defects are treated. Jumping, scale, hairlines, crazing, copperheads, and chipping are discussed. Discusses tearing of the enamel during burning, pinmarks, and warpage of the ware. Shop management is dealt with. Systems of wage payment—day work, piece work, and bonus work—are discussed. AWM (32)

Rubber Lining for Tanks and Valves. N. Swindin. *Mechanical World & Engineering Record,* Vol. 43, Jan. 27, 1933, pages 79-81. A mixture of emulsified rubber, Portland cement and sand, when applied to any surface, forms an excellent bed on which to apply sheet rubber. After the surface wax has been removed by solvent or solution, and after softening by warming, the sheets are applied like wallpaper, and rolled on to remove the air trapped. Curing is done by continued application of boiling water. Tanks, pipes, and valves have been successfully lined with rubber as a protection against chemical attack. Kz (32)

On Rust-proof Paints without Linseed Oil. (Über leinölfreie Rostschutzfarben.) J. F. Sacher. *Der Bautenschutz,* Vol. 3, May 5, 1932, pages 56-58. In the introduction disadvantages of rust-proof paints on linseed oil base and chemical processes concerned are dealt with. Author compares application, yield and properties of coatings involving rust-proof paints without linseed oil, so called Tropic- or Tropisco paints, with those containing linseed oil. Kz (32)

Technique of Enameling. Sheet Enameling. (Die Emailliertechnik. Einbrennen von Blechemailien und Verzierungen.) *Sprechsaal für Keramik, Glas, Email,* Vol. 65, Nov. 24, 1932, page 844. Abstract of a paper by J. E. Hansen in *British Industrial Finishing,* Vol. 3, 1932, pages 49, 75. The ground coat of sheets should in general not be burnt at temperatures higher than 860°-870° C. The faults due to too high firing temperatures are discussed. When the enamel has too low a viscosity it may easily occur that it is overburned. On the other hand when the enamel layer is too thick the enameling time may be too long and a subsequent second firing may be required. The temperatures are given to attain highest luster on the cover coat of sheet enamels. The luster is spoiled by too high firing temperatures and too long firing time. The treatment of the pieces during and subsequent to enameling is discussed. The various causes of failures are dealt with. Castings and sheets should be carefully inspected before enameling. When minor defects are eliminated in time later defects may be avoided. GN (32)

Non-Metallic Coatings for Apparatus of Chemical Industry. (Les revetements protecteurs. Non metalliques pour appareils d' industrie chimique.) A. Matagrin. *La Revue de Chimie Industrielle,* Vol. 41, Sept. 1932, pages 253-260; Oct. 1932, pages 281-287. Subject is extensively discussed under following headings: I. Protection of metals used in chemical apparatus. (1) advantages and inconveniences of metallic material; (2) means of external and internal protection of metals against corrosion. II. Mineral protective coatings: (1) coatings on ceramic and silicate base; (2) enameling. III. Organic coatings: (1) rubber; (2) "Rollatex"; (3) "Vulcoferran." The last 2 represent a special kind of rubber suited for lining apparatus. WH (32)

Automobile Coatings. H. C. Mougey & R. J. Wirshing. *Industrial & Engineering Chemistry,* Vol. 23, Dec. 1931, pages 1352-1354. Materials used and typical finishing systems for bodies, fenders, wheels, and chassis are described. Disadvantages of present materials and systems are discussed. Desired improvements are listed. MEH (32)

Iron, Chromium and Lead Pigments. (Technisches über Eisen-, Chrom- und Bleipigmente.) A. Foulon. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Feb. 26, 1933, pages 118-119. New methods of manufacture of these pigments are considered. It is shown that valuable methods of processing have been devised in recent years which mean not only an improvement and cost reduction but also an improvement of the quality of these pigments finding increasing use against corrosion attack. GN (32)

Enameling. (Emaillewissenschaft.) Ph. Eyer. *Emailletechnische Monatsblätter,* Vol. 8, Sept. 1932, page 70; Oct. 1932, page 78; Nov. 1932, page 86. Deals with ground coats. To obtain tightly adhering enamels base must be fired at higher temperature than cover enamel. For certain ware cast base is replaced by a black base for which composition are given. Also in majolica enameling it is advisable to use a black base. Splashing of this black coat in majolica enameling of stoves and cracking of enamel is avoided by use of "Haftgrundborolith" in combination with an unburnt ground coat. GN (32)

Cent's Worth of Fuel Does 100 Lb. of Work. J. B. Nealey. *Automotive Industries,* Vol. 68, Feb. 11, 1933, pages 163-164. Description of operation of japanning department of Midvale Steel Products Co., Detroit. Mechanical units are all grouped along a continuous conveyor and heating processes are mechanized and synchronized with this conveyor grouping. First unit on brake assembly line is a combination washing machine, japan dip, and bake oven served by a single travelling conveyor, consisting of 2 chains suspended between sprockets which support 8-ft. bars between them. Work is hung on these bars and is taken through the 7 operations without interruption, washing, drying, cooling, dipping, draining, baking and cooling. Details are given for each operation. DTR (32)

Enameling of Copper and Copper Alloys. (Über das Emaillieren von Kupfer und Kupferlegierungen.) *Emailletechnische Monatsblätter,* Vol. 9, May 1933, pages 35-38. Enameling of Cu and Cu alloys offers great difficulties. By a new method developed by the Ernst Heene Co. a transparent enamel on these metals can be obtained. The composition of the enamel is given and the method of procedure is discussed at length. GN (32)

A Pioneer Discovery in the Fields of Rust Preventing Coatings on Ships. (Eine Pionier Erfindung für Rostschutzanstriche von Schiffen.) Br. Schulz. *Schiffbau, Schiffahrt und Hafenbau,* Vol. 32, Sept. 15, 1931, pages 411-413. After briefly reviewing various efforts in producing an efficient anti-rust coating for maritime purposes, attention is focussed on the Faktor Firnis of the H. Frenkel Co., Leipzig-Mölkau, which comprises "vulcanized" linseed oil, a readily volatilizing varnish solvent and low additions of high-boiling hydrocarbons, volatile oils, organic amines or ester. Due to pre-oxidation of oil, a rapid setting of paint coating takes place. Other additions are to prevent loss in viscosity during transportation. WH (32)

A Study of a Group of Typical Spinels. C. W. Parmelee, A. E. Badger & G. A. Bullam. *University of Illinois Bulletin,* Vol. 29, June 17, 1932, No. 84. *Engineering Experiment Station Bulletin* No. 248, 54 pages. Price 30 cents. The spinels were made by mixing and grinding the proper oxides in the required proportions, usually with an excess of the basic oxides, plus boric acid, and heated to 1000°-1700° C. depending on the materials. The boric acid acted as a flux and volatilized. The material was then leached, usually with HCl. The residues were examined by the X-ray method for purity. Zn, Mg, ferrous and manganous aluminates, chromites and ferrites were studied as to scratch hardness, density, lattice dimensions, heat capacity and thermal expansion. Melting points were not determined. Some information as to solubility in and resistance to fluxing by various agents is given. The work was aimed to give some of the fundamental data of interest from the point of view of use of the spinels in refractories and as enamel opacifiers. HWG (32)

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ORE CONCENTRATION (33)

Progress in Metal Mining in Manitoba. GEORGE E. COLE. *Transactions Canadian Institute of Mining & Metallurgy,* 1932, pages 35-57. See *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 128. AHE (33)

Methods and Costs of Developing and Equipping the Ashley Gold Mine, Matachewan Gold District, Ontario. W. H. EMENS & CHAS. F. JACKSON. *United States Bureau of Mines, Information Circular* No. 6707, Apr. 1933, 27 pages. Costs of building and equipping a mill and refinery for Au ore are detailed. AHE (33)

The Recovery of Gold from a Copper Gold Ore from Vidette Lake, British Columbia. ALEX. K. ANDERSON. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 103-107. An ore assaying Cu 0.62%, Au 0.585 oz. and Ag 0.91 oz./ton yielded 51% of its Au by amalgamation and an additional 36.6% with 76% of the Ag in a concentrate assaying 14.5% Cu and 4.50 oz. Au and 15.34 oz. Ag/ton. Amalgamation and flotation of an ore assaying Cu 0.96%, Au 0.66 oz. and Ag 1.10 oz./ton gave 91% recovery. AHE (33)

Experimental Tests on Two Samples of Gold Ores from the Reno Gold Mines, Ltd., Salmo, Nelson Mining Division, B. C. J. S. GODARD. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 93-102. A sulphide ore containing pyrite, sphalerite, galena, pyrrhotite, chalcopyrite, and arsenopyrite analyzed Au 3.25 oz./ton, Cu 0.06%, Pb 3.30%, Zn 6.05%, Fe 11.64%, S 13.4% and insoluble 58.16%. Amalgamation at -65 mesh gave 55.1% recovery, flotation of the tailing 40.3% further recovery, and cyanidation of the flotation tailing 2.2% more, a total of 97.6%. Tests on a 50:50 mixture of the sulphide ore and an oxidized ore analyzing Au 5.58 oz./ton, Cu 0.15%, Pb 0.48%, Zn 0.84%, Fe 6.83%, S 0.41% and insoluble 86.02% gave 96.9% recovery by amalgamation and cyanidation of the tailing, 97% by amalgamation, flotation and tabling of the tailing, and 96.6% by amalgamation, flotation and cyanidation of the tailing. Cyanidation of the reground flotation concentrate extracted 98.3% of the Au. Flotation was in 2 stages. In the first, reagents were Na_2CO_3 2.0 oz., water gas tar A 0.20 lb., Na_2S 0.40 lb., amyl xanthate 0.03 lb. and pine oil 0.08 lb./ton; the second, $CuSO_4$ 0.30 and amyl xanthate 0.06 lb./ton. AHE (33)

Gravity Concentration (33b)

A New Type of Riffle. J. HEDLEY. *South African Mining & Engineering Journal,* Vol. 43, pt. II, Dec. 31, 1932, page 316. A new riffle which is said to increase extraction of Au and precious metals from slime of crushed ore is described. AHE (33b)

Methods and Costs of Milling Ferberite Ore at the Wolf Tongue Concentrator, Nederland, Boulder County, Colo. WILLIAM O. VANDERBURG. *United States Bureau of Mines, Information Circular* 6685, Jan. 1933, 15 pages. Ferberite ore at Wolf Tongue Mill averaged 5.72% WO_3 in 1931. Quartz is chief gangue mineral. Ore, crushed to -¼", is jigged; the coarse tailing is crushed to -⅛" and returned to the jig; the -⅛" tailing is classified into 4 products and treated by a jig and sand tables. Middlings from sand tables and tailings from jig are ground in a ball mill and returned to tables. Table tailing pulps are thickened and treated on 6 slime tables. 2 classes of concentrate are produced,—55% WO_3 and 30-35% WO_3. Total recovery for 1931 was 86.6%. Total costs for 8 mo. of 1931 were $6.015/ton. AHE (33b)

Mechanical Dredging Devices for Tin. K. BAUTE. *Mechanical Handling & Works Equipment,* Vol. 20, Apr. 1933, pages 111-113. Concentrators for use on Sn dredgers are described and illustrated in principle, and a brief account given of some modern Sn dredgers. JCC (33b)

Flotation (33c)

A Brief Outline of Flotation. H. C. CURWEN. *South African Mining & Engineering Journal,* Vol. 43, pt. II, Jan. 14, 1933, pages 341-342. A review, including the function of each common reagent. AHE (33c)

Principles of Flotation, II.—An Experimental Study of the Influence of Cyanide, Alkalis and Copper Sulfate on the Effects of Potassium Ethyl Xanthate at Mineral Surfaces. IAN WILLIAM WARK & ALWYN BIRCHMORE COX. *American Institute of Mining & Metallurgical Engineers, Technical Publication* No. 495, Feb. 1933, 24 pages. The influence of pH and concentration of NaCN on contact between air and sulphides of Fe, Pb, Zn and Cu in a solution containing 25 mg./l. of K ethyl xanthate were determined. The results plotted in a series of curves indicate the conditions necessary for separating the various minerals by flotation. Galena is unaffected by cyanide. The amount of cyanide required to depress the Cu and Fe minerals at any given pH increases in the following order: pyrite, chalcopyrite, bornite, covellite and chalcocite. There is a critical pH value for each mineral above which there is no response and below which pH is of value only in so far as it controls the cyanide ion concentration. Sphalerite, marmatite and christophite are equally sensitive to cyanide and/or alkali in the presence of $CuSO_4$. Pyrrhotite is not activated in the same manner. The higher the concentration of $CuSO_4$, the greater is the capacity of sphalerite and chalcopyrite to withstand the action of the cyanide; activation is more effective in neutral, cyanide-free solution. Certain frothers were found to have little or no effect on the contact angles. 21 references. JLG (33c)

Differential Flotation of Ores. (Le Flottage Differentiel des Minerals.) EUGENE ALAKAZOFF. *Chimie et Industrie,* Vol. 28, Oct. 1932, pages 768-776. General flotation tests on the following ores are described: Pb-Zn, Cu-Pb-Zn, Zn-Pb high in Zn, oxidized Pb-Zn (all carrying traces of Au and Ag), auriferous pyrite and an ore of Hg. MAB (33c)

Identification of Cerussite and Anglesite, and Flotation with Galena. FRED D. DEVANEY & R. E. EVANS. *United States Bureau of Mines, Report of Investigations* No. 3214, June 1933, 9 pages. Small bodies of oxidized ore occur in some deposits of disseminated galena. The presence of oxidized ore in a mill feed normally would result in added tailing loss. Such an ore was examined and it was found that the oxidized Pb minerals slimed more readily than the galena. A large portion of the coarser galena and some of the oxidized Pb minerals were recovered by tabling. Flotation with the reagents customarily used in galena flotation, lost 30% of the Pb. Xanthates were the best collectors and cresylic acid the best frother. Use of NaS in the scavenger circuit with return of the oxide froth to the roughing circuit for recleaning gave an over all recovery of 97.12% and a tailing containing 0.24% Pb. AHE (33c)

Action of Alkali Xanthates on Galena. T. CLINTON TAYLOR & A. F. KNOLL. *American Institute of Mining & Metallurgical Engineers, Contribution* No. 26, Feb. 1933, 16 pages. Behavior of xanthate solution in contact with finely ground galena was studied. Action of alkali xanthates with galena is one of ionic interchange. The alkalinity developed is due to $PbCO_3$. Alkali xanthate is not adsorbed as such. Sulphide ion from galena does not take part in the interaction. S-O ions apparently are formed on galena and are displaced by the sulphydryl radical. Xanthate ion is oriented by displacement of these anchored S-O ions. 21 references. JLG (33c)

Milling Methods and Costs at the San Guillermo Concentrator of the Compania Industrial "El Potosi," S. A., San Guillermo, Chihuahua, Mexico. C. A. MEHRING, F. J. BACON & ORA WISER. *United States Bureau of Mines, Information Circular* 6706, Apr. 1933, 22 pages. From a sulphide ore containing Pb 11.26, Zn 11.48% and Ag 8.59 oz./ton, a Pb concentrate containing 67.94% Pb, 3.71% Zn and 48.09 oz. Ag/ton is produced using NaCN 0.050, cresylic acid 0.056, lime 0.479 and amyl or butyl xanthate 0.110 lb./ton. Tailings go to the Zn circuit where a rougher concentrate obtained with $CuSO_4$ 0.424 and ethyl-xanthate 0.125 lb./ton is cleaned with NaCN 0.010 lb./ton to give a concentrate containing Pb 0.93%, Zn 46.53% and Ag 1.72 oz./ton. Total recoveries are Ag 87.84%, Pb 95.65% and Zn 82.88%. Total costs (details given) in 1932 were $0.5039/ton. AHE (33c)

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Crushing (33e)

The Use of a Composite Grinding Load in Tube Milling on the Witwatersrand. B. F. WARTENWEILER. *Journal Chemical, Metallurgical & Mining Society of South Africa,* Vol. 33, Feb. 1933, page 246. Discussion. See *Metals & Alloys,* Vol. 4, May 1933, page MA 165. AHE (33e)

Notes on Power Used in Crushing Ore, with Special Reference to Rolls and Their Behavior. JOHN S. OWENS. *Bulletin Institute Mining & Metallurgy,* No. 342, Mar. 1933, 51 pages; discussion, No. 343, Apr. 1933, pages 1-21. After discussing existing theories as to the power used in crushing, the author develops a new expression which takes account of 7 ways in which the energy applied in crushing is used: (1) tearing apart the ore at the fractured surfaces, (2) elastic compression prior to breaking, (3) elastic distortion of crushing machine, (4) rubbing between pieces of ore after breaking, (5) rubbing between ore and machine, (6) sundry losses such as lifting pieces of ore and rubbing before breaking, noise, vibration, heat, etc., and (7) mechanical friction of machine. A mathematical expression is developed for each. (1) and (2) cover the energy required to break the ore and are irrecoverable; (3) is mainly returned by the machine; (4) to (7) are pure waste. Collecting these expressions, W(net)=

$$C\,\frac{x-1}{D}\ (\text{or } C_1 \log x^3) + C_3\left(\frac{D}{S}-\frac{S}{D}\right) + C_4,$$

when W = net energy, D = diameter of original pieces, x = reduction ratio, S = the roll setting, C = the constant of (1), C_1 = the constant of (2), C_2 = the constant of (3), C_3 = the constant of (4) and (5), C_4 = the constant of (6), and C_5 = the constant of (7). C should change only with the ore crushed, C_1 and C_3 probably are constant for each ore, C_4 and C_5 will vary with the machine. Methods of calculating diameters of ore pieces are discussed. The formula is applied to results of several crushing tests and values of C, C_1 . . . . . C_5 developed. Tests of roll crushing show that breaking in one operation gives a higher output, less fines and uses less power than stage-crushing, however arranged. AHE (33e)

Rubber Linings for Grinding Mills. HOWARD E. FRITZ. *Crushing & Grinding,* Vol. 1, May-June, 1932, pages 163-164. Advantages of rubber linings over steel for grinding mills are (1) ease of installation, (2) takes only ¼ installation time of steel, (3) larger inside diameter (rubber only 1" thick), (4) less weight, (5) quieter operation, (6) greater cyanide efficiency, (7) minimizes color contamination, and (8) saving in transportation charges (less weight). AHE (33e)

MANUFACTURERS' LITERATURE

Stainless Steel

The Carpenter Steel Company has compiled a particularly valuable book for manufacturers. It tells how to select the proper type of stainless steel for any specific purpose, how to get the best results in machining stainless steel, how to heat treat the various grades of stainless steel, how to make stainless steel stampings, how to handle galvanic action, intergranular corrosion, etc. All the data have been conveniently arranged for quick reference and are brought right up to date. Carpenter Steel Company, 135 Bern St., Reading, Pa. (272)

Forging Steel

The Vanadium Corporation is distributing reprints of an article entitled "Manganese-Chrome-Vanadium Steel for Automotive Forgings" which is a detailed discussion of their "Normalloy." (273)

Aluminum Alloys

Nicral is a trade name applying to a series of aluminum alloys offered by the Nicralumin Company. These alloys are produced in three grades, A, B and X, and will be supplied heat treated or not, as required. The company has prepared a booklet describing these alloys as well as a table of comparative weights of Nicral, brass, copper, zinc and steel in sheet form. (274)

Refractory Concrete

Hydrecon is a combination of refractory materials to be used as a hydraulic refractory concrete. General directions for its use are given in a leaflet sent out by the Greenpoint Fire Brick Company. (275)

Welding Wrought Iron

Wrought iron may be welded by any of the commonly used methods such as gas, electric arc, electric resistance and hammer welding. The procedure is in general the same as that used in welding mild steel with certain slight modifications. Complete directions will be found in a pamphlet sent out by the A. M. Byers Company. (276)

Brazing Alloy

Bulletin No. 5 from the Handy & Harman Company is devoted to their Sil-Fos, a brazing alloy containing silver. It melts readily at 1300° F., is very free flowing, and works very well with copper, brass, bronze, nickel, nickel silver, Monel metal and other non-ferrous metals and alloys fusing above 1300° F. (277)

Oil-Gas Generator

A folder from the Vapofier Corporation describes their device for changing oil from the liquid to the gaseous state and mixing this gas with the proper amount of air for combustion. The Vapofier is said to provide a wide range of temperatures under accurate control, from the moderate heats required in various baking operations to the high heats used in carburizing and steel treating. (278)

Optical Instruments for the Metal Working Industries

Practically every type of optical instrument which is of interest to the metal working industries is described in a recent catalog from the Bausch & Lomb Optical Company. The list includes a contour measuring projector, toolmakers' microscope, Brinell microscope, metallographic microscope, as well as complete metallographic equipment. (279)

Lubricants

E. F. Houghton & Company have issued a booklet describing their line of Sta-Put lubricants. These oils have been given a special polymerization treatment which nearly doubles their film strength, increases their lubricity and increases their adhesiveness so that they always "stay put" in the bearing. (280)

High Temperature Alloys

A profusely illustrated catalog has been received from the Michigan Steel Casting Company. Various steps in the manufacture of their Misco alloys for high temperature service are pictured in addition to numerous applications. A short summary gives the physical properties of these alloys. (281)

Steel

Jalcase steel, produced by the Jones & Laughlin Steel Corporation in three carbon grades, is the subject of a booklet sent out by the company recently. In the .10/.20 carbon grade Jalcase offers exceptional machinability, while in the .25/.35 and .30/.40 carbon grades it has desirable heat treating properties. It is particularly suitable for intricate drop forgings which require much machining. (282)

Heat and Corrosion Resisting Alloys

Bulletin No. 21 from the Standard Alloy Company lists the most popular analyses of Standard-Alloy together with safe workable loads at different temperatures. One or two applications for each analysis are suggested. (283)

Stainless Steels

Characteristics of the usual types of their Silcrome stainless steels are given in a chart sent out by the Ludlum Steel Company. This is one of their Blue Sheets and is punched for filing in a loose leaf folder. (284)

Atmosphere Control

Bulletin No. 20 from the C. I. Hayes Company discusses the effects of atmosphere control in precision hardening as carried out in their Certain Curtain furnace. In this furnace the atmosphere may be established, maintained, varied and duplicated with precision and so will provide the particular atmosphere necessary for each type of steel. (285)

ADVERTISERS' INDEX

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Pyrometer

A leaflet sent out by the Industrial Pyrometer Company describes the K & S Aestometer, a radiation type indicating optical pyrometer. This instrument is accurate within 1% of scale reading, may be moved easily, is durable and adaptable. The temperatures are read directly in degrees Fahrenheit or Centigrade. (286)

Air Heaters

A recent pamphlet from the Surface Combustion Corporation describes their direct gas-fired air heaters for heat treating, drying, core and mold baking, etc. Several installations are illustrated and operating data on three typical installations are given. (287)

Iron and Steel Castings

According to a leaflet from the Alpha-Lux Company the use of their Liquitol in its different grades for ingots and castings of alloy steel, cast iron, carbon steel and tool steel will eliminate piping, reduce heads 40% and practically eliminate cavities and porosities. Instructions for using Liquitol A for alloy steel are included in the leaflet. (288)

Electric Heating Elements

Bulletin A from the Globar Corporation is devoted to their non-metallic electric heating elements suited for applications in which the temperatures range from 1900° F. (1038° C.) to 2750° F. (1510° C.) This range covers the heat treatment of high speed steels, firing of ceramic ware and the heating of metals for forging. (289)

Molybdenum

The Climax Molybdenum Company has distributed an interesting leaflet showing by micrographs how molybdenum in cast iron improves graphite distribution, sorbitizes pearlite and toughens carbides. (290)

Continuous Bright Annealing

A four-page leaflet issued by the Electric Furnace Company briefly describes some new developments in controlled atmosphere furnaces for deoxidize annealing, bright normalizing and bright annealing both ferrous and non-ferrous metals. Sheet, strip, coils, tubing and wire are delivered from these furnaces clean, bright and dry. (291)

Nickel Cast Iron

Section 3, Number 4 of the Nickel Cast Iron Data published by the International Nickel Company is devoted to their Ni-Tensyliron, a nickel cast iron with tensile strength greater than 50,000 lbs./in.^{2} The composition, physical properties and heat treatment of this iron are given as well as suggested applications, such as gears, turbine casings, valves, pressure housings, etc. (292)

Corrosion-Resisting Alloy

Illium-G, in addition to being inert to chemical action, has other advantages which make its use satisfactory for corrosion resisting purposes. It may be machined without difficulty and is easy to weld, grind and polish. Its physical characteristics are given in a leaflet sent out by the Burgess-Parr Company. (293)

Potentiometer Pyrometer

Bulletin 190 from the Foxboro Company is an unusually attractive booklet which describes in detail their single-record and multiple-record potentiometer pyrometers. (294)

Pressed Steel Products

Tank builders will be interested in a leaflet from the Lukens Steel Company which gives the specifications for their pressed steel products for oil storage tanks, for basement tanks, etc. (295)

Surface Pyrometers

A particular advantage of the new surface pyrometer manufactured by the Pyrometer Instrument Company is that contact and reading of actual temperatures do not have to be made simultaneously. They are furnished in two types, one for flat surfaces, one for curved surfaces. (296)

Paint

Bulletin No. 12 from the American Chemical Paint Company discusses their "Kemick," a black chemical paint that stays on surfaces that get hot, even red hot, and prevents rust under these severe conditions. It will not burn off or turn brown. (297)

Metal Coating

The Metals Coating Company of America has prepared a booklet giving a clear definition and history of the sprayed molten metal coating process, as well as the properties of metal coatings, preheating and postheating, finishing metal coatings, etc. (298)

Refractories

"Carbofrax," the Carborundum brand silicon carbide refractory, is discussed in Bulletin No. 3 from the Carborundum Company, particular attention being given to veneered construction, in which the veneer blocks are applied to the fireclay arch by inserting support legs through the arch where they are fastened with metal clips. Thus the entire support of the veneer is placed on that portion of the fireclay arch which is subjected to least severe furnace conditions. (299)

Rust Preventive

The Dearborn Chemical Company has prepared a booklet on the use of their No-Ox-Id as a rust preventive on bridges, rolling stock and plant equipment. It is furnished in several consistencies for various service conditions. These are listed together with the method of application in each case. (300)

Sand Blasting Nozzles

A leaflet received from the Stoody Company describes the use of their product, Borium, in sand blasting nozzles. These are available in various dimensions and prices which are listed. These nozzles have the advantage of being much more durable than the ordinary iron nozzle. (301)

Stainless Clad Steel

A folder has just been issued by the Ingersoll Steel & Disc Company illustrating many applications of IngOclad stainless clad steel. It deals with the use of IngOclad in almost every phase of the metal working and process industries where the corrosion resistance and sanitation of stainless steel is desired, combined with the low cost of the fabricated product. (302)

Refractory Products

Plastic fire brick, hearth and baffle material, and a new refractory material for forge furnace hearths are discussed in a leaflet just received from the Standard Fuel Engineering Company. A chart to assist in choosing the proper refractory material for the work at hand is included and will be found interesting. (303)

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I should like a copy of each piece of Manufacturers' Literature listed below.

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NEW MATERIALS and EQUIPMENT

New Arc Welder

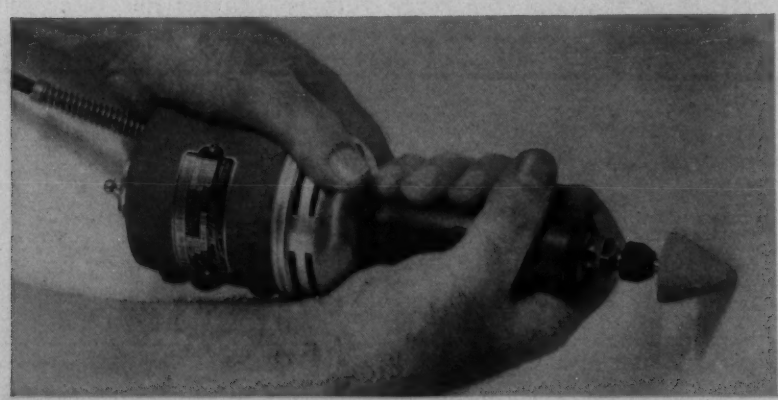
The new protected 300 amp. arc welder manufactured by USL Battery Corporation, Niagara Falls, N. Y., has 4 main poles and 4 interpoles, giving a full range of welding current with perfect commutation at all loads. A wide range of welding current can be quickly and accurately obtained by a dual adjustment. The motor is of the standard induction line start type. The welder has a magnetic, push button operated motor starter providing under voltage and thermal overload protection. The starter is mounted in the steel shell of the welder in a convenient, easily accessible place.

The exciter is mounted directly on the main generator shaft and the exciter housing is an integral part of the main generator frame. The armatures of the exciter, generator and motor are all mounted on one heavy oversize shaft. The rating of the welder is 40 volts and the welding range is from 40 to 550 amps. The open circuit voltage is 25 to 80 volts. The truck is of all welded steel construction with removable steering handle. The overall dimensions are: Length, 52"; Height, 36"; Width, 24". The weight is 1400 pounds.

Metals & Alloys, November 1933

Portable Electric Grinder

For rough, off-hand grinding, for touching off parts, tools and dies, and for varied grinding and shapening jobs, the Chicago Wheel & Mfg. Co., Chicago, Ill., has announced the Hand-ee Hi-Power Grinder. It is compact, well balanced, light and powerful. With a suitable grinding wheel or cutter inserted in the chuck, this tool works at any angle, getting into and around corners, into irregular shaped holes and other hard-to-reach places. Grinding, polishing and cutting are accomplished with a minimum of time and labor. Three grinding wheels are furnished with the tool, and over

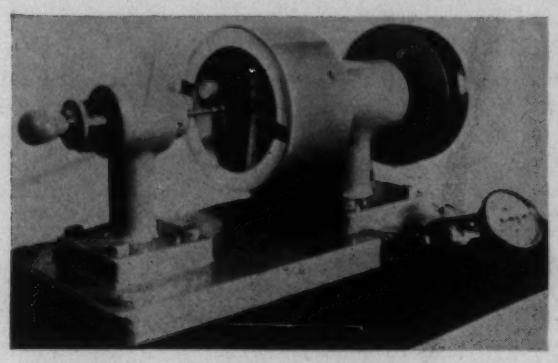


100 shapes and sizes are available to meet practically every need, thus providing a multiple-service tool at a low one-tool cost. A universal motor provides abundant power for a wide variety of work. The tool has a maximum speed of 17,000 r.p.m. and may be plugged in on either alternating or direct current, 110 volts. High-speed, dust-sealed ball bearings reduce friction, eliminate over-heating and assure maximum power delivery. Specially balanced, case-hardened chucks are regularly supplied.

Metals & Alloys, November 1933

Torsion Impact Tester

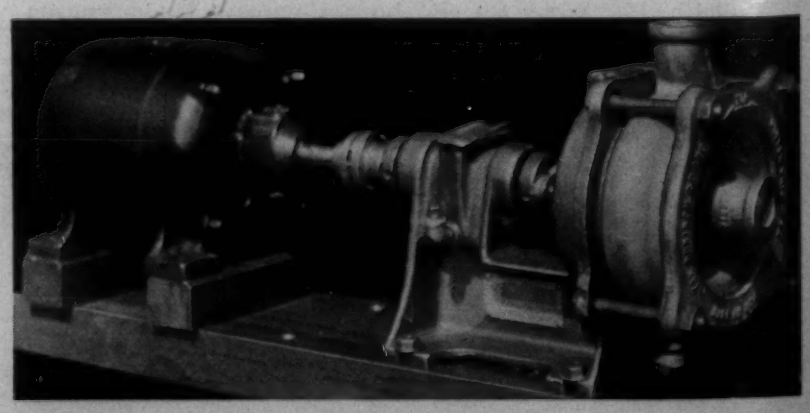
The machine consists of 2 major parts, first a momentum unit, and second a head for holding the specimen, both of which are rigidly bolted to the bed plate. The momentum unit consists of a pair of balanced flywheels mounted upon a shaft which is free to rotate in a ball bearing mounted in the housing. The flywheel carries on its outer face 2 symmetrical striking bosses. The flywheels may be rotated by means of the counter-balanced handle. The head is made up of a holder sleeve, having a square hole in one end, into which the head of the specimen is clamped by means of set screw. To the opposite end of the specimen is attached the crossarm having a square hole into which the head of the specimen is snugly fitted and secured with a set screw. The holder sleeve can be slid axially in the housing by means of the knob, and is prevented from rotating by a key. The extent of the axial movement of the sleeve and specimen is so limited, that when the slide is pulled entirely back, the crossarm will clear the bosses, and when it is pushed forward to its fullest extent it will almost touch the face of the flywheel. The actual operation of making the test is essentially as follows: The test specimen is clamped in the holder sleeve, as already described, with the crossarm properly attached. The knob is pulled entirely back so that the crossarm entirely clears the bosses. The flywheels are then rotated by means of the handle (or when very high speeds are required by a friction wheel driven by a portable motor on the periphery of the flywheel to a predetermined speed measured by a portable tachometer driven on the periphery. The knob is then pushed sharply inward, bringing the crossarm into engagement with the bosses on the rotating wheel, and the specimen is thus broken under torsion impact. The residual speed of the wheel is then read, and since the kinetic energy corresponding to various wheel speeds has been previously calculated from the moments of inertia of the various moving parts, the energy absorbed in foot-pounds in breaking the specimen can be readily obtained from a prepared table. From the above description it is evident that the actual operation of making the test is extremely simple. One operator only is required, and the entire operation of mounting and breaking the specimen and obtaining the result requires only about 2 minutes. The figure shows the machine with the specimen set up ready for test and the portable tachometer. A guard made of thin sheet screwed to the flywheel, and extending beyond the striking bosses, prevents the crossarm from flying after the specimen is broken. A guard made of wire gauze is swung over the middle portion of the machine during testing to prevent the flying of fragments. Baldwin Southwark Corp., Nicetown, Philadelphia, Pa.



Metals & Alloys, November 1933

Pump for Corrosive Chemicals

A new centrifugal pump for handling corrosive chemicals, the smallest ever built by them, is being announced by The Duriron Company, Inc., Dayton, Ohio. It has a 1" suction, 1" discharge, and at 1750 r.p.m., the head and capacity range from 2½ gal./min. at a 25 ft. head to 25 gal./min. at a 5 ft. head, with power consumption varying from approximately ¼ h.p. to less than ½ h.p., these figures being based on



water. It is available in either belt or direct motor drive, and has a closed-type impeller. The pump, Model 2A, is procurable in Duriron (for general acid service), Durichlor (for hydrochloric acid), Durimet (low-carbon nickel-chromium-silicon alloy steel for weak sulphuric acid at all temperatures), Durco Alloy Steels (low-carbon "18-8"—KA2S and KA2SMo), Alcumite (copper-aluminum-iron alloy for weak sulphuric acid), and in the chemical lead alloys.

Metals & Alloys, November 1933

GENERAL (0)

Development of the Science of Metals. (Die Entwicklung der Metallkunde.) G. TAMMANN. *Zeitschrift für Metallkunde,* Vol. 25, Jan. 1933, pages 3-5. A brief essay on developments in the science of metals during the last 25 years. Twenty-fifth anniversary number of this journal. See also *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 233. RFM (0)

Powdered Metals of First Importance. Correspondence from J. W. WEITZENKORN. *Metal Progress,* Vol. 22, Aug. 1932, pages 52-53. Predicts many new applications for powdered metals and believes that such materials will afford solutions to many problems which metallurgists cannot satisfactorily solve with cast metals. WLC (0)

Metallurgical Developments during 1931. H. M. BOYLSTON & G. M. COVER. *Fuels & Furnaces,* Vol. 10, Jan. 1932, pages 11-24. Developments in blast furnace and open-hearth practice, coreless induction furnace, corrosion resisting steels, nitriding, metallographic theories of alloys, scaling and hardening problems are discussed. Ha (0)

The Manufacture and Heat Treatment of Sheet and Strip Steels. E. F. DAVIS. *Fuels & Furnaces,* Vol. 10, Feb. 1932, pages 113-118; Mar. 1932, pages 205-208; Apr. 1932, pages 261-264; May 1932, pages 345-348; June 1932, pages 399-400, 404. Principal points in manufacture, rolling, annealing, normalizing, inspecting, testing, defects, etc., are thoroughly discussed, the equipment used in the various stages described. Ha (0)

High-Quality Large Castings of Aluminum Light Alloys. (Hochwertiger Gross-Formguss aus Aluminium-Leichtlegierungen.) W. CLAUS. *Die Giesserei,* Vol. 19, Nov. 25, 1932, page 481. Problem of replacing large iron and steel castings by castings of light alloys is discussed. Consideration of melting, molding, and phenomena of gas development, segregation and shrinking in proper manner will tend largely to an almost general application and replacement of large steel castings by Al. Ha (0)

Industrial Research as a Profitable Business. *Metal Progress,* Vol. 22, Aug. 1932, pages 41-45. Survey of research organization and aims of General Motors Corporation. WLC (0)

Forged or Die Cast Parts? (Pressteil oder Pressgussteil?) W. BRUNNKOW. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Mar. 12, 1933, page 158. Brief discussion of advantages and disadvantages of both methods. GN (0)

From Test Tube and T-Squares. *Iron Age,* Vol. 130, Sept. 22, 1932, pages 436-447. Discusses briefly progress made in metallurgy, heat treating and mechanisms. Takes up the development of nitralloy, mechanical handling in steel plants, drop forging, arc welding, heat and corrosion resistant alloys, rubber lining for pickling tanks, heavy duty chilled cast Fe rolls, furnace refractories, Cr plating, dissociated ammonia in furnace atmospheres, high alumina brick, alloy steel and Fe developments, hydrocarbon gas for carburizing, Cd in Fe and steel preservation. VSP (0)

How to Use a Laboratory. *Metal Industry,* London, Vol. 41, Dec. 23, 1932, page 609. A few brief remarks on the uses of a laboratory as advertisement or, rather humorously, as the "goat" which is to take the blame for everything that goes wrong in the business. Ha (0)

Italian Books Mostly Concern the Finishing Operations. Correspondence from FEDERICO GIOLOTTI. *Metal Progress,* Vol. 22, Nov. 1932, page 45. Due to lack of natural resources Italian metallurgists are chiefly interested in books on finishing operations in the manufacture of high quality products. WLC (0)

Steel, Twenty Years From Now. FLOYD W. GRADY. *Iron Age,* Vol. 129, Feb. 4, 1932, page 327. Brief discussion of the future development of steel manufacture and application. VSP (0)

Fabricated Parts vs. Cast Iron. E. B. SHORE & A. W. WALKER. *Foundry Trade Journal,* Vol. 47, Dec. 8, 1932, pages 347-348. Summary of a debate on respective merits of cast Fe and fabricated parts. Advantages of welding over casting and disadvantages from point of view of mechanical strength are discussed. OWE (0)

Advances in the Nickel Industry. ROBERT C. STANLEY. *Iron & Steel of Canada,* Vol. 16, Jan. 1933, pages 5-6. Advances are reviewed under (1) Ni-clad steel plate, (2) stainless alloys, (3) welding, (4) heat-resisting alloy, (5) Ni steels, cast Fe, and wrought irons, (6) Ni-Hard and Ni-Resist. OWE (0)

Some Aspects of the Selection of Engineering Materials. L. B. HUNT. *Foundry Trade Journal,* Vol. 47, Dec. 22, 1932, pages 384-385; Dec. 29, 1932, pages 397-398; *Metal Industry,* London, Vol. 42, Jan. 20, 1933, pages 97-100. Mechanism of stress resistance in metals and of failure by deformation and rupture is made basis of specification of materials. It is concluded that failure depends on relation between cohesion and resistance to slip. Usual methods of increasing slip resistance are summarized. More detailed specifications involve chemical analysis and an examination of microstructure. Most reliable single test appears to be given by tensile test. Notched bar test and fatigue testing are described. Ha + OWE (0)

Metallurgy and the Electrical Industry. COLIN J. SMITHELLS. *Metal Industry,* London, Vol. 42, Jan. 13, 1933, pages 71-73, 79. Close connection between the metallurgical and electrical industry and fruitful coöperation in developing products and processes are pointed out; heat and corrosion resisting materials, electric furnaces and electric welding, bimetallic strips, particularly brass and invar and Ni-Fe alloys, are some of the most important developments and results of this coöperation. Ha (0)

General Rules for Formulating Specific Alloys. Correspondence from ALBERT PORTEVIN. *Metal Progress,* Vol. 22, Dec. 1932, pages 47, 52. The formulating of new alloys for special purposes is possible by following the general rules given, such as highly concentrated solid solutions as Fe-Ni, for high electric resistance, and others. WLC (0)

Interdependence of Electricity and Metallurgy. Correspondence from ALBERT PORTEVIN. *Metal Progress,* Vol. 22, Nov. 1932, pages 42-43. Numerous examples are given of the influence of progress in electricity on metallurgy and vice versa. WLC (0)

Supra Conductivity. (Supraleitfähigkeit.) W. MEISSNER. *Ergebnisse der exakten Naturwissenschaften,* Vol. 11, 1932, pages 219-263. (1) Fundamental facts. (2) Supra conducting metals, alloys and compounds. (3) Empirical laws on break points and slope of curve near break point. (4) Experiments on effect of a magnetic field and a deformation. (5) Investigations into nature of supra conductivity phenomenon. (6) Conclusions on nature of supra conductivity and basis for a theory on latter. 121 references. WH (0)

The Relationship of Engineering to Metallurgy. F. C. LEA. *Engineering,* Vol. 135, Apr. 21, 1933, pages 447-448. Condensed from the presidential address delivered before the Sheffield Society of Engineers and Metallurgists, Jan. 16, 1933. LFM (0)

Tool Steel from the Consumer's Standpoint. H. G. KESHIAN. *Transactions American Society for Steel Treating,* Vol. 20, Sept. 1932, pages 233-248. Previously abstracted as Preprint No. 37, 1931. See *Metals & Alloys,* Vol. 3, June 1932, page MA 157. With discussion. WLC (0)

Science of Metals and Practice. (Metallkunde und Praxis.) U. RAYDT. *Zeitschrift für Metallkunde,* Vol. 25, Jan. 1933, page 5. A brief essay. RFM (0)

Pictorial English (Bildwort Englisch), Part 5. Engineering Materials. VDI Verlag, Berlin, 1932. Paper 5¾x8¼ inches. 32 pages. In the preface Dr. Matschoss urges German engineers to learn English. The idea of accomplishing this is to present pamphlets, this one on materials. Where possible an illustration with the English words on it is used. Where it is not possible to use illustrations, text is used. The pamphlet is written in very poor English and appears to be a translation from German. Richard Rimbach (0)-B-

PROPERTIES OF METALS (1)

The unusual metal or alloy of today may be the usual metal of tomorrow.

You will profit by looking over this section as well as the sections on non-ferrous and ferrous alloys.

The Heat Capacity of Selenium from 100° to 300° A. THOS. DE VRIES & L. FRANCIS DOBRY. *Journal American Chemical Society,* Vol. 54, Aug. 1932, pages 3258-3261. Heat capacity of metallic Se was determined by Nernst method. Se was carefully purified by Lenher and Kao method. Experimental values for temperature range from 100° to 300° A. lie between 6.08 and 7.25. Values for this range have not been reported previously. Value calculated for 300° A. is approximately 10% higher than that reported by Bettendorf and Wüllner. MEH (1)

Mechanism of Superconductivity. J. DORFMAN. *Nature,* Vol. 130, July 30, 1932, pages 166-167. Theories explaining transition from normal conductivity to superconductivity are touched upon and author advances his interpretation of phenomenon. Kz (1)

New Studies in Physics of Metals. (Neue Arbeiten über Metallphysik.) J. DORFMAN. *Metallwirtschaft,* Vol. 12, Apr. 21, 1933, pages 221-223; Apr. 28, 1933, pages 235-237. An attempt was made to determine what properties of materials are related to superconductivity, or the disappearance of electrical resistance of some metallic conductors at low temperatures. It was found that in all superconductors the product of the conductivity at room temperature and the coefficient of the Hall effect, which equals the looseness of the union between conducting electrons and their atoms, designated γ, is much smaller than in non-superconductors. The theory is proposed that all factors, such as temperature, magnetic fields, and high frequency currents, which cause the disappearance of superconductivity, function in such a way as to furnish enough energy to the conductivity electrons so that they are brought into the state of Ohm's resistance. An equation is deduced setting forth these relationships, which agrees closely with equations obtained empirically by other investigators. Galvano-magnetic tests made in a specially designed apparatus on liquid K-Na alloy and liquid K proved that the Hall effect exists in liquid metals, and that the change in resistance has a linear relation to the field intensity. The theoretical aspects of the effect of mechanical deformation on the location of Curie point, and of magnetic moments in ferro-magnetic alloys and valence forces are discussed. 10 references CEM (1)

Hall Effect in Beryllium. A. CICCONE. *Nature,* Vol. 130, Aug. 27, 1932, page 315. Description of the investigation on Be (99.5%) yielding a value of the Hall coefficient of $+ 0.0024 \pm 0.0001$. Kz (1)

New Process for Commercial Production of Nickel. (Über ein neues Verfahren zur technischen Verarbeitung des Nickels.) G. HAMPRECHT & L. SCHLECHT. *Metallwirtschaft,* Vol. 12, May 19, 1933, pages 281-284. Ni powder, which has been prepared by heating Ni carbonyl in closed containers to 1200° C., can be converted into very pure homogeneous metallic Ni by sintering at 1000°-1200° C. and then pressing, hammering or rolling. It has the advantages of low temperature preparation, requiring no special furnaces, freedom from slag and inclusions and greater purity than otherwise obtainable, being especially free from S, O and other gases. It has sp.gr. 8.85, tensile strength 40 kg./mm.^{2}, yield point 12 kg./mm.^{2}, elongation 50%, reduction of area 80%, and Brinell hardness 90. It has been used for specially pure anodes, sheet, strip, foil, and wire. Ni-Mn alloy can be made by sintering Ni powder containing sufficient C with MnO_2. During sintering C reduces the MnO_2, CO and CO_2 are expelled, and the Mn alloys completely with the Ni. Ni-Fe alloys are made by sintering Ni carbonyl and Fe carbonyl in the desired proportions together. Alloys containing 30-50% Ni with very high magnetic permeability and saturation, and with small definite coefficients of expansion are obtainable. Alloys of Ni with Mo, W, Cu, and Ag can be made by sintering the powders together. Bimetallic Ni alloys for thermal purposes can be made by filling the sinter form partly with Ni-Fe powder of one composition and partly of another composition. Bimetal strips of great cohesion are obtained by this method. 9 references. CEM (1)

Sublimation of Mg in Vacuum and Its Casting in an Atmosphere of Argon. (La sublimation du magnésium dans le vide et sa coulée sous atmosphère d'argon.) J. HÉRENGUEL & G. CHAUDRON. *Comptes Rendus,* Vol. 195, Dec. 19, 1923, pages 1272-1274; *Chimie et Industrie,* Vol. 27, Special Number, Mar. 1932, pages 248-250. 2 diagrams illustrate an apparatus for sublimation in vacuum and for fusion and casting in an atmosphere of argon. Castings obtained are very malleable. The hardness of the metal is compared with that of ordinary commercial Mg. MAB + OWE (1)

Free Energy of Some Copper Compounds. MERLE RANDALL, RALPH F. NIELSEN & GEORGE H. WEST. *Industrial & Engineering Chemistry,* Vol. 23, Apr. 1931, pages 388-400. First extensive review of equilibria of a metallic element. Most of 19 substances whose free energies are tabulated are important compounds in the metallurgy of Cu. Equilibria deal especially with high-temperature reactions of Cu. Present values are consistent with previously published free energies. 102 references. MEH (1)

Indium Available in Commercial Quantities. WILLIAM S. MURRAY. *Industrial & Engineering Chemistry,* Vol. 24, June 1932, page 686. Physical and chemical properties of In are described. In can be electrodeposited satisfactorily, either alone or with other metals. In combination with other metals, In adds stability and hardness to the surface. The metal can be obtained in greater abundance now that richer ore deposits have been found. MEH (1)

The Change in the Infra-red Reflecting Power of Bismuth in a Magnetic Field. J. C. MCLENNAN, E. J. ALLIN & A. C. BURTON. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Vol. 14, Sept. 1932, pages 508-512. Infra-red reflecting power of Bi is very much less than electromagnetic theory and direct current value of change of conductivity indicate. Gives details of methods of experimental work. 4 references. RHP (1)

Superconductivity with High-Frequency Currents. J. C. MCLENNAN, A. C. BURTON, J. O. WILHELM & A. PITT. *Nature,* Vol. 130, Aug. 6, 1932, page 201. Discussion of experiments carried out on the phenomena of superconductivity with a.c. of high frequency, which confirm the reality of the frequency disturbance of the superconducting point. Kz (1)

Interferometer Measurements in the Extreme Ultra-violet Region of Copper. J. C. MCLENNAN & F. M. QUINLAN. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Vol. 14, Nov. 1932, pages 823-829. Authors recently published a list of wave-lengths of lines in the extreme ultra-violet region of Cu spectrum, λ 2300 A.U. to λ 2085 A.U. Present research extends this table of wave-length below λ 2100 A.U. to λ 1979 A.U. RHP (1)

PROPERTIES OF NON-FERROUS ALLOYS (2)

Thermoelectric Forces in Systems Tellurium-Sulphur and Tellurium-Selenium. (Ueber die Thermokräfte in den Systemen Tellur-Schwefel und Tellur-Selen.) A. PETRIKALN & K. JACOBY. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 210, Jan. 1933, pages 195-202. Thermoelectric forces of Te-S and Te-Se alloys against Ag were determined, they are irregular and show as much as 575 millivolt per 1° C. max. and about 440 min. Ha (2)

On the Superconductivity of Alloys Containing Gold and Silver. J. C. MCLENNAN, J. F. ALLEN & J. O. WILHELM. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Ser. 7, Vol. 13, June 1932, pages 1196-1209. Includes short bibliography. Deals with alloy systems Ag-Sn, Au-Sn, and Au-Pb. Describes experimental methods and presents several tables and diagrams showing results. Eutectics are more "stable" as regards superconductivity than are compounds. This investigation bears out the de Haas theory, i.e. between crystal faces in the mixed structure of a eutectic there must exist forces of considerable magnitude which cause superconductivity to appear at temperatures other than would be expected. RHP (2)

Modern Development of Aluminum and Its Alloys. (Die neuzeitliche Entwicklung von Aluminium und seinen Legierungen.) M. HAAS. *Aluminium*, Vol. 14, Oct. 15, 1932, pages 1-3. Review of uses of Al, its advantages over heavy metals and its characteristic properties. Ha (2)

The Mechanical Properties of Certain Samples of Monel Metal. T. W. HARDY & H. H. BLEAKNEY. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 161-163. Tensile properties, Izod impact tests and Brinell hardness for 14 samples of Monel metal purchased in the open market agree with trade data of the International Nickel Co. AHE (2)

The Specific Heat of Monel Metal Between —183° and 25° C. W. F. HAMPTON & J. H. MENNIE. *Canadian Journal of Research*, Vol. 7, Dec. 1932, pages 677-679. Heat capacity of Monel metal over the range—183° to 25° C. has been measured in an adiabatic calorimeter. By differentiation of the equation representing the heat capacity curve, an equation for specific heat over this range is obtained and values at various temperatures calculated. Specific heat at 20° C. is found to be 0.0997. OWE (2)

History of the Development and Theory of Hardenable Aluminum Rolling Alloys. (Zur Geschichte der Entwicklung und Theorie aushärtbarer Aluminium-Walzlegierungen.) G. SACHS. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Aug. 20, 1932, pages 829-830. Causes of hardening of duralumin and their theories since invention of alloy (for which patent protection in Germany just lapsed) are reviewed and most generally employed alloys described. Only Cu and Mg are important alloying materials for Al. Present view is that hardening phenomenon must be ascribed to a critical dispersion, that is to mechanical effects of segregations from supersaturated solutions whereby especially $MgSi_2$ and $CuAl_2$ are formed. There must exist, however, a difference between cold-hardening and hot-hardening as in former electrical resistance increases, in latter decreases. This is probably due to fact that hardening in cold state affects only solid solution. Methods of improving corrosion resistance of some alloys by plating with pure Al, alloys with high Mg content with natural good corrosive resistance, addition of Zn and replacing Mg by Li for alloys of much better machinability, and hardening by heat-treating are briefly described. 20 references. Ha (2)

Aluminum Silicon Alloys. (Sur les alliages aluminium-silicium.) BRONIEWSKI & SMIALOWSKI. *Revue de Métallurgie*, Vol. 29, Nov. 1932, pages 542-552; Dec. 1932, pages 601-604. Properties of Al-Si were studied on alloys made of 99.7% Al and 97.3% Si. Specimens were chill cast, annealed for 50 hours in vacuum at 520° C. and cooled to room temperature in 50 hours. The eutectic point was found to be at 575° C. and with 11.5 atomic % Si. Limit of solid solubility of Si was around 96 atomic % at the solidus and 97% at room temperature. Alloys with about 94% Si have a specific resistance of 0.07 ohm./cm.^{2} and a practically zero temperature coefficient. They are brittle but can, apparently, be used for electric resistors. Thermoelectric couple formed of 96% and 97% Si alloys has a remarkably high e.m.f. To check the claimed advantage of $TiCl_4$ on the physical properties of the alloy its vapors were bubbled through alloys heated to 800° C. until 0.1% Ti was introduced. The results showed that Ti treatment did not improve the properties, while NaCl-NaF treatment did. No heat treatment of specimens for physical testing was used. JDG (2)

Hardenable Lead Alloys. (Härtbare Bleilegierungen.) B. GARRE & F. VOLLMERT. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 210, Jan. 1933, pages 77-80. Hardening influence of additions of Ag, Sn and Cd on Pb was investigated; in all cases a more or less appreciable hardening effect was noticeable, quenched samples showed a greater hardness than slowly cooled samples. An etching method using 120 cc. concentrated HCl, 100 cc. H_2O, 90 g. crystallized Cu chloride was found particularly suitable for Pb alloys. Ha (2)

Factors Determining the Properties of White Bearing Metals. J. NEILL GREENWOOD & G. B. O'MALLEY. *Proceedings Australasian Institute Mining & Metallurgy*, No. 87, Sept. 30, 1932, pages 207-215. In general, Sn base alloys possess strength, plasticity, anti-friction, wear-resistance and good casting properties in greater degree than Pb base. Constitution rather than composition determines properties of a bearing metal. Changes in constitution and consequently properties result mainly from variations in conditions of casting. AHE (2)

Testing Light-Metal Piston Alloys. (Prüfung von Leichtkolben-Baustoffen.) PAUL SOMMER. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 4, 1932, 47 pages. Requirements of light-alloys suitable for pistons are discussed. It was concluded that wear resistance was important, and 10 cast Al-base alloys, Elektron and gray iron were tested on bearing tester designed by Schwarz. As for bearing metals, those alloys having a large number of rather large hard particles embedded in a ductile matrix were best. Thermal conductivity of alloys was determined by an apparatus developed by author. Conductivity for an average temperature of 60° C. ranged from 0.248 to 0.38 cal./cm.sec.° C. for Al alloys. Coefficient of expansion for temperature range 20°-300° C. was from 15.7 to 22.2 $\times$ 10^{-6}. Brinell hardness tests were made at temperatures between 20° and 300° C. Some of alloys softened at higher temperatures due to structural changes. 9 references. JLG (2)

Electrical Conductivity of Binary Aggregates. (Om den elektriska ledningsförmangan hos binära aggregates.) GUYS SONFREY. *Arkiv för Kemi, Mineralogi och Geologi*, Vol. 10 A, 1932, 33 pages. Electrical conductivity of alloys built up by 2 kinds of crystals, cannot be evaluated as a function of composition according to the rule of mixture. All attempts at establishing a universally applicable formula fail. Based on his conceptions writer derives formulae which also hold true for large values of conductivity ratio n of both components. Application of formulae to experimental data shows a close agreement and even fairly correlates conductivity to composition in limiting case $n = \infty$. Author's formula can be advantageously used for evaluating correction when determining conductivity of any substance contaminated by a second element. WH (2)

Aluminium Bronze. FRANK HUDSON. *Foundry Trade Journal*, Vol. 48, Feb. 2, 1933, pages 86-89; Feb. 9, 1933, pages 106-107; Feb. 16, pages 121-123; Mar. 2, pages 152-154. Phases existing in Al bronzes are illustrated by 14 photomicrographs. A Cu-Al equilibrium diagram covering range of compositions of interest is used as basis for discussion. Latest methods of handling Al bronze in foundry and usual forging practices are summarized. Typical photographs of microstructure of bronzes produced under various conditions and of various compositions are given. Resistance to corrosion is illustrated quantitatively for the action of various aerated solutions. 54 photographs illustrate uses of Al bronze. OWE (2)

PROPERTIES OF FERROUS ALLOYS (3)

Pours Steel in Pressure Castings. FRED T. HAYS. *Foundry*, Vol. 60, Aug. 1932, pages 12-13, 45. After extended experiments the Atlantic Foundry Co., developed a metal for use in pressure castings, a plain C steel. The steel is melted in electric furnace made by Pittsburgh Electric Furnace Co. and operating on an acid bottom. The steel shows the following chemical analysis and physical properties: C 0.22-0.25%; Mn 0.65-0.75%; Si 0.40-0.45%; P 0.045% max.; S 0.045% max.; ultimate tensile strength 74,000 lbs./in.^{2}; yield point 46,000 lbs./in.^{2}; elongation in 2 inches 34%; reduction in area 52%. Compares properties of the C steel with properties called for in specifications as outlined by the A.S.T.M. Stresses importance of certain points in working heats in electric furnace. VSP (3)

Progress Report on Chromium-Nickel-Iron Alloys. V. N. KRIVOBOK. *Mining & Metallurgical Investigations, Carnegie Institute of Technology, Mining & Metallurgical Advisory Boards*, 6th Open Meeting, Oct. 1932, 20 pages. Includes discussion. Work done on alloys of the general Cr-Ni type is reviewed. Researches on decomposition of Cr-Ni-Fe alloys at elevated temperatures and influence of latter on impact strength, apparatus and methods for impact testing, heat treating, magnetic and corrosion tests and microscopic examination are discussed and results of steels of different composition tabulated. A great deal of work was done with the 18-8 alloy with low C content, 0.01 to 0.02%, in special crucibles and under different very low air pressures to determine any tendency for decomposition or intergranular corrosion up to 2200°F. reheating temperature. Results were negative in so far as no typical intergranular corrosion as is usual in commercial Cr-Ni alloys could be found. Effect of gases on strength at elevated temperatures was a further object of investigation, especially of the 18-8 alloy. They all were tested at definite stress and changes examined microscopically. In each case an abundance of precipitated carbides was found and life of sample bore a definite relation to mode of distribution of carbides. Fracture occurs through failure at grain boundaries. Influence of magnetic phase and that of C was further emphasized in the discussion. 26 references. Ha (3)

Physical Properties and Structure of Binary System Iron-Cobalt. (Physikalische Eigenschaften und Struktur des Zweistoffsystems Eisen-Kobalt.) A. KUSSMANN, B. SCHARNOW & A. SCHULZE. *Zeitschrift für technische Physik*, Vol. 13, No. 10, 1932, pages 449-460. The constitutional diagram of the system Fe-Co shows that in both the liquid and the solid state both metals mix in any ratio just below the melting curve. The α solid solution extends from 0 to 78% Co and has a cubic space-centered structure. A close investigation of this range showed between 30 and 70% Co higher values of electric and thermal conductivities with a pronounced maximum at 50% Co. Other physical properties do not show any peculiarities in this range. The maximum conductivity decreases with increasing temperature and disappears at 800°C. almost entirely. An explanation for the phenomenon is seen in the grouping of the valency electrons. Ha (3)

High Test Cast Iron. R. S. MACPHERRAN. *Foundry*, Vol. 60, July 1932, pages 12-13, 50. Chiefly a discussion of practices followed in various foundries to secure exceptional physical properties. In general high test Fe is made in foundry by one of the following processes: (1) Electric furnace (with or without duplexing from cupola); (2) Air furnace (with or without duplexing from cupola); and (3) Cupola. Electric furnace, either melting with an initial cold charge or duplexing with cupola melting, lends itself to continuous production of small castings. VSP (3)

Heat and Corrosion Resisting Steels. A. J. JACK & R. J. SARGENT. *Iron & Steel of Canada*, Vol. 15, Dec. 1932, pages 150-154. General description of Cr steels, austenitic Cr-Ni steels, etc., and of their applications in engineering. A classification of heat-resisting steels is given. OWE (3)

Constitution and Properties of Acid-Proof Silicon Cast Iron. (Ueber Konstitution und Eigenschaften des säurebeständigen Silizium-Eisenguss.) R. WASMUHT. *Angewandte Chemie*, Vol. 45, Sept. 3, 1932, pages 569-573. High resistance of Fe-Si alloys against acids which increases with increasing amount of Si in spite of easy solution of components in acid is explained by existence in cast material of homogeneous solid solutions, that is of uniform crystals. This is illustrated by Fe-Si equilibrium diagram which shows 3 chemical compounds: Fe_3Si_2, FeSi and $FeSi_2$. Especially the formation of heteropolar solid solution FeSi contributes to high resistivity against acids and high brittleness. Methods to produce a good silicon iron are described and a table of resistance against attacking agents given. 44 references. Ha (3)

Manufacture of Rustless Steels in America. (Die Herstellung rostfreier Stähle in Amerika.) M. H. SOMMER. *Zeitschrift Verein deutscher Ingenieure*, Vol. 77, May 13, 1933, page 508. Review of manufacturing concerns and their products. Chemical analysis of 6 most generally used Cr and Cr-Ni steels and their mechanical properties is given. Ha (3)

The Influence of Recrystallization on Mild Steel Rolled Below Its Critical Range. JOSEPH VIETORISZ. *Carnegie Scholarship Memoirs, Iron & Steel Institute*, Vol. 21, 1932, pages 153-191. Experiments on a mild steel reduced about 10, 13 and 16% at various temperatures below 700° C. to show the effects of subsequent annealing on hardness and structure are described. 11 tables show the percentage reduction, hardness and temperature and time of anneal. 29 graphs illustrate effect of time, deformation and temperature. Tensile tests are also given. Compression work was made with aid of a steel wedge at an angle of 1 in 10 to give a steadily increasing degree of deformation. The hardness annealing temperature curves of the reduced steel show one maximum, one minimum and then slowly rise again to a second but lower maximum. The critical amount of cold work showed a distinct slope between 550° and 650° C. annealing temperature in graphs. Recrystallization showed at points deformed slightly more than the points of maximum hardness; recrystallization starts at these points of maximum hardness. Velocity of grain growth was greatest at 650° to 700° C. Specimens rolled at 300° to 400° C. recrystallized most rapidly. In specimens rolled above 400° C. annealing influence decreased abruptly with increasing temperature, in agreement with change in hardness. A second deformation at 20° C. after rolling at 200° to 400° C. gave softer specimens than without the second deformation. Specimens rolled at a temperature higher than that at which rapid recrystallization takes place showed great resistance to softening and change of structure when annealed below the critical range. Micrographs indicate that work-hardening due to deformation took place mostly along the pearlite bands due to the greater hardness of the pearlite. The decisive factor in recrystallization is the work-hardening, regardless of the temperature of deformation. Resistance to a coarsening influence, which took place with rising temperature from the point of maximum hardness with accompanying softening effect, was shown by specimens rolled at 200°-400° C. Those rolled at 700° C. had least resistance, while those rolled at 20° and 550° C. were of intermediate resistance. The original material deformed 20% and annealed at the same temperature, 820° C., showed remarkable coarsening. Grain counts prove these results. Tensile tests indicate that an optimum temperature must be chosen to obtain the best annealed material. Tensile strength and traction hardness decrease quicker with increasing temperature than yield point, while elongation increases with temperature. Ratio of Vickers hardness to tensile strength decreased from 3.6 at 350° to 2.76 at 770° C. Malleability increased with rising temperature, both in and across the direction of rolling. The higher the annealing temperature, the smaller the difference between the 2 directions of rolling, but the value never reached that obtained on specimens rolled at 850° C. Thus, to produce mild steel of best quality in all directions, rolling "hot" at a low temperature above critical is better than rolling "cold" below critical, followed by suitable annealing. WLC (3)

Quality Steel Conference in Leningrad on Nov. 19-21, 1932. V. N. SVECHNIKOV, K. F. STARODOUBOV & B. S. BARSKY. *Domez*, No. 12, 1932, pages 48-57. (In Russian.) Abstracts of the papers delivered at the conference. Alloy steels were discussed. (3)

here is the STEEL *for* Helical Springs

INDEPENDENT wheel suspension brings many problems to the automotive engineer. One of them is how to obtain the right steel for the helical springs.

In addition to the usual properties of high-grade steel, service in helical springs calls for a surface absolutely free from seams or other imperfections. Even a hair-line seam in the surface of a bar, so small that critical inspection can't always catch it, offers a foot-hold for fatigue, and the spring breaks at that point.

Bethlehem metallurgists have developed a method of making spring-steel bars with a surface free from the imperfections that give fatigue its chance. Their work along this line was done with a view to eliminating breakage of springs in railway work, probably the most severe service helical springs are called upon to endure. The results are now available to the automotive industry as it considers helical springs.

Another matter of great importance is decarburization, on account of its bearing on uniformity of heat treatment. Bethlehem gives special attention to this point in making bars for springs and because of long experience in making fine special steels is exceptionally well prepared to control decarburization.

The use of spring bars made by Bethlehem will solve one of the important problems involved in the change to helical spring suspension. *Bethlehem Steel Company, Bethlehem, Pa.*

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BETHLEHEM *fine* ALLOY STEELS

Made of **ILLIUM-G**

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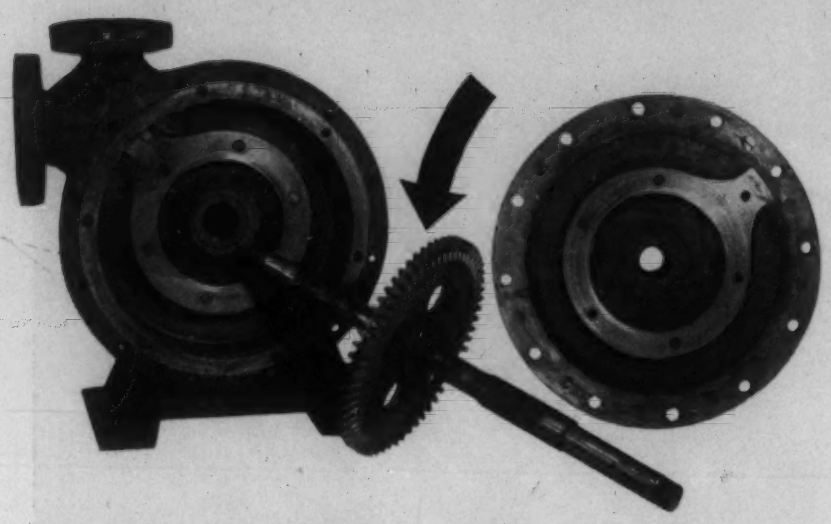

takes the **BITE** out of

CORROSIVE MINE WATER

Illium-G ON THE JOB

THE FIRST Illium-G pump parts were made in 1922 for Westco Pump Corporation, Davenport, Iowa.

At that time considerable difficulty was experienced in securing a metal to withstand the attack of mine water containing sulphuric acid. Alloys previously used on this job lasted only a few weeks. Finally a Westco Turbine-type Pump with impeller made of Illium-G was installed on the job. That pump is still in service and a recent inspection showed the tool marks on the impeller easily visible.

The illustration above was taken six years after the pump was put into service. Note the corroded condition of the shaft which was made of a supposed corrosion resisting metal. Now note the Illium-G impeller which is practically untouched.

Westco still uses Illium-G on pumps that are subjected to severe corrosion conditions.

Write to Us

If a corrosion problem exists in your plant or if the product which you make is subjected to corrosive conditions, we are glad to offer our experience and facilities in helping you to a satisfactory solution. No obligation. Just send us a description of the conditions involved.

BURGESS-PARR COMPANY
DIVISION OF C. F. BURGESS LABORATORIES INC.
MOLINE, ILLINOIS

CORROSION, EROSION, OXIDATION, PASSIVITY & PROTECTION (4)

Corrosion costs industry many thousands of dollars. Are you keeping up-to-date on this important subject?

The Influence of Non-metallic Inclusions on the Corrosion of Steels. C. E. HOMER. *Iron & Steel Institute, Carnegie Scholarship Memoirs,* Vol. 21, 1932, pages 35-37. Preliminary report of study of effect of inclusion on corrosion of steels indicates that inclusions of sulphides and of scale act sometimes as centers of corrosion about which pitting takes place. All inclusions of this type do not act in this way and silicate and alumina inclusions appear to have no effect. In solutions of NaCl, and Na_2SO_4 to which a little Na_2CO_3 has been added, and tap and distilled water, inclusions which act as centers of pitting develop very early if they develop such effect at all. In some cases these centers become inactive after a time. In case of pure NaCl solution and to a less extent in sea water attack develops more slowly. More complete data on this work will be presented in Second Report of Corrosion Committee of Iron & Steel Institute. WLC (4)

The Reduction of Corrosion in Water Pipe. EDW. S. HOPKINS. *Baltimore Engineer,* Vol. 7, Mar. 1933, pages 8-10, 14-15. pH of water is an indication of its corrosive action. Detailed analytical data show that water with a pH value at saturation point of $CaCO_3$ deposits a coating that retards corrosion. With bright Fe surfaces pH values between 5.0 and 9.0 are of equal merit in retarding corrosion by waters that do not form protective coatings. Describes lime treatment of water to give pipe protection and gives cost data. RRS (4)

Corrosion Research on Light Metals. FREEMAN HORN. *Society Chemical Industry, Chemical Engineering Group, Preprint,* Jan. 13, 1933, 11 pages. A review. Corrosion theories, classes of corrosion, methods of measuring corrosion, effects of corrosion, corrosion of duralumin, corrosion fatigue, the prevention of corrosion, and corrosion of Mg are discussed. AHE (4)

Effect of Tap Water Containing Copper or Aluminum. (Über die Einwirkung kupferhaltigen Leitungswassers auf Aluminium.) L. W. HAASE. *Metallwirtschaft,* Vol. 12, Mar. 10, 1933, page 137. It has often been found that corrosion product from Al corroded locally by tap water contained Cu. A deposition of metallic Cu from water could take place only if water contained H_2SO_4 and such water would not be fit for drinking. Neutral and slightly alkaline water containing small amounts of Cu forms a scale on Al in which Cu is uniformly distributed. Cu content of scale at corroded spots is higher than in other parts of scale, so that it is reasonable to believe that pitting was not due to Cu contained in water. It is suggested that such pitting of Al is caused by particles of metallic Cu being lodged mechanically in Al and galvanic action taking place between Al and Cu. CEM (4)

The Passivity of Electrolytic Iron in an Alkaline Medium (Sur la passivité du fer électrolytique en milieu alcalin). A. TRAVERS & J. AUBERT. *Comptes Rendus,* Vol. 194, June 27, 1932, pages 2308-2309. Experiments were made to decide whether the passive state of Fe in a solution of caustic soda is due to the alkali itself or to O dissolved in it. O was removed by means of a current of N and the potential became in the limit-0.96 volt as against -0.24 volt after standing in air. Anions affecting the passivity in the presence of O are without effect when O is removed from the solution. The passivity in an alkaline medium thus appears to be due to dissolved O and not to hydroxyl ions in solution. OWE (4)

Protective Coatings Against Corrosion. (Schutzüberzüge gegen Korrosion.) A. TUTEUR. *Schriften der Hessischen Hochschulen,* 1932, No. 4, pages 85-89. Paper presented at 25th anniversary of Staatliche Materialprüfungsanstalt Technische Hochschule Darmstadt, Oct. 29, 1932. An account is given of metallic and non-metallic protective coatings. Metallic coatings must be free from pores so that protective layer is not easily destroyed by formation of local elements. Enamels for cast Fe must be free from Pb and Sn so graphite will not reduce metallic oxides and thus cause bubbles. Discussion of paints and lacquers concludes paper. GN (4)

Non-Metals Head List in HCl Resistance. S. L. TYLER. *Chemical & Metallurgical Engineering,* Vol. 39, Sept. 1932, pages 488-489. Where greatest freedom from attack is required, even with acid of low concentration, use of non-metallic construction materials is practically imperative. While it is still hot, HCl gas is not severely corrosive, but when temperature drops below 110° C., corrosion problem begins. In storage, best practice today is use of rubber lined tanks of wood or steel. Materials employed by acid manufacturers and users are: fused silica, glass, glass enameled-steel, chemical stoneware, rubber, tantalum, and the alloy, Hastelloy A. PRK (4)

The Significance of H_2 Absorption by Fe in the Corrosion Process. (Die Bedeutung der Wasserstoffaufnahme des Eisens für den Korrosionsvorgang.) U. R. EVANS. *Korrosion und Metallschutz,* Vol. 8, Mar. 1932, page 68. The central portion of a metal under a drop was found to be attacked in atmospheres saturated, unsaturated, and supersaturated with H_2O vapor. In the case of half immersed plates unattacked areas were observed near the water line under atms. of O_2 and air. Under N_2 and H_2 the attacked areas reached up to the water line. BER (4)

Requirements of Airplane Coatings. J. L. MCCLOUD. *Industrial & Engineering Chemistry,* Vol. 23, Dec. 1931, pages 1334-1339. Important factor at present in coatings for airplanes is a finish to protect and ornament metal surfaces. The greater portion of present day airplane structures is of light metal alloys, and these are prone to corrosion of the intercrystalline type. Such corrosion lowers the elongation obtained in tensile test specimens and makes what is called a more brittle condition. The best way to evaluate protective coatings is to apply them to test bars of thin light metals and steels. These coated test pieces are exposed to corroding conditions, and the changes in physical properties measured and plotted. Such comparisons, carried out in long-time salt-spray corrosion tests and exposures to Florida roof conditions, are given. MEH (4)

On the Corrosion of Welded Joints in Soft Steel. (Sur la corrosion des soudures d'acier doux.) FRANCIS MEUNIER. *Comptes Rendus,* Vol. 196, Jan. 23, 1933, pages 271-273. Welded joints of different mechanical qualities were repeatedly immersed in a 3% solution of NaCl over a period of about a year. Three types of corrosion were recognized: (1) deep corrosion of the joint compared with the rest of the specimen, (2) corrosion confined to certain spots only, and (3) no difference in the corrosion of the joint and of the rest of the material. A relation between the energy absorbed in breaking the test piece (Charpy impact test) and the electrolytic potential was sought, the results being interpreted in terms of oxide dissolved in the metal. The corrosion is determined by the amount of dissolved oxygen, which also regulates the resistance of the joint to impact. OWE (4)

Combating Rust with Metallic Finishes. R. B. Mears. *Bell Laboratories Record,* Vol. 11, Jan. 1933, pages 141-144. Mechanism of rusting by electro-chemical action, i.e. formation of small electrical cells between 2 metals in presence of a film of an electrolyte, is explained and the different methods of providing reliable metallic coatings are described. Ha (4)

The Determination of the Life of Lanoline Rust Preventing Coatings on Steel. C. Jakeman. *Engineering,* Vol. 134, Dec. 23, 1932, pages 750-751. From a report from the National Physical Laboratory. Tables are given showing the results of exposing coated and uncoated test pieces for 3 yr. and 5 yr. in dry store and in ammonium nitrate shed. Crude lanoline as basis for rust preventatives was found to give satisfactory results. LFM (4)

Petroleum Tank Coatings. Brian Mead. *Industrial & Engineering Chemistry,* Vol. 24, Aug. 1932, pages 857-859. Different types of coatings applied to tank interiors and exteriors are given as: conventional paint with linseed oil or other similar vehicle, varnishes and resins, synthetic resins and condensation products, metal coatings as sprays and thin sheet, galvanizing, sheet Al. Corrosion by H_2S is discussed. MEH (4)

Boiler Water Treatment and Scale Prevention. H. E. Jones. *Fuel Economist,* Vol. 8, Feb. 1933, pages 315-316. Review of recent work on subject. DTR (4)

Erosion and Erosive Corrosion. (Kavitation und Kavitationskorrosion.) J. Ackeret. *Werft, Reederei und Hafen,* Vol. 13, Aug. 15, 1932, pages 239-240. See "Investigations on Corrosion by Water Impingement," *Metals & Alloys,* Vol. 4, Apr. 1933, page MA 102. WH (4)

Progress in Mitigating Cable Sheath Electrolysis. Frank E. Reeves & Charles F. Avila. *Electrical World,* Vol. 101, June 3, 1933, pages 720-722. Structure being attacked is maintained at the same potential, or slightly negative to, the structure to which the current is flowing by bonding to tracks, negative return feeders, or negative bus bars in the station. Since this often requires a long wire and also since the size of wire determines the average potential of the structure in question, method was devised to indicate proper wire size to use. CBJ (4)

Steam Boiler Corrosion and Its Prevention. (Dampfkessel-Korrosion und ihre Verhütung.) Hans Richter. *Chemiker-Zeitung,* Vol. 57, Mar. 29, 1933, pages 241-242. Pits in the bottom and on the sides of boilers have been found to be caused by the accumulation of mud or scale containing occluded CO_2. Together with O from the air the CO_2 attacks the steel. If caustic soda has been used for treating the water the condition becomes worse. It is heavy and accumulates in the mud. This mixture gradually flocks and hardens in about 2 hours. To avoid corrosion from this cause the boilers should be blown down for 1 to 2 seconds every 2 hours. A valve suitable for blowdowns is described. 5 references. CEM (4)

Prevention of Corrosion of Metals by Sodium Dichromate as Affected by Salt Concentrations and Temperature. B. E. Roetheli & G. L. Cox. *Industrial & Engineering Chemistry,* Vol. 23, Oct. 1931, pages 1084-1090. Effects of additions of soluble chromates to distilled water and NaCl solutions, at room temperatures, on corrosion rates of steel, wrought Fe, Zn, galvanized steel, Cu, brass, Al, and Pb were investigated. Additional studies were also made in cases of steel, wrought Fe, and Zn of the effects of increasing temperature on corrosion rates in similar solutions. Chromates were found suitable for prevention of corrosion of wrought Fe and steel at all temperatures investigated in distilled water, 0.003%, 0.05%, 3.5%, and 22% NaCl. Al was almost completely protected in presence of chromates at room temperatures in dilute salt solutions and corroded slightly but focally in strong salt solutions. Partial protection of Cu, brass, galvanized steel, Pb, and Zn from corrosion in distilled water and salt solutions at room temperatures was obtained by addition of chromates to corroding medium. It is important to add sufficient quantities of chromate, otherwise pitting will occur. Increasing salt concentrations, in general, progressively accelerated corrosion of nonferrous materials, whereas wrought Fe and steel corroded more rapidly in dilute solutions than in distilled water or concentrated solutions. Increasing either temperatures or salt concentrations made necessary use of greater quantities of chromate for same degree of protection obtained at lower temperatures or in more dilute salt solutions. MEH (4)

Intergranular Corrosion of 18/8 Austenitic Stainless Steels. E. C. Rollason. *Iron & Steel Institute, Advance Copy* No. 12, May 1933, 24 pages. Commercial steels of the 18-8 type were heated for different times at temperature between 450° and 900° C. and their susceptibility to intergranular corrosion determined by boiling in $CuSO_4$-H_2SO_4 solution. The samples were ⅛″ thick and were bent over a ¼″ diameter rod after boiling. One steel contained 0.59% W, one 4.1% Mo, and another 0.59% W and 0.47% Ti. The C was between 0.09 and 0.19%. Samples were rapidly cooled from several temperatures before being subjected to the final reheating. The time at temperature necessary to produce deterioration depended on the temperature being a minimum near 750° C. The addition of 0.59% W increased the time necessary to produce deterioration, but decreasing the C from 0.2 to 0.1% was just as effective. Cu decreased resistance. The presence of 4% Mo or 0.5% Ti with 0.6% W rendered the steel magnetic and resistant to deterioration when air cooled from 1050° C. When quenched from higher temperatures it was less resistant. The resistance to deterioration decreased as grain size increased. Steels containing a small amount of ferrite were more resistant than those containing only austenite. It was concluded that deterioration resulted from precipitation of carbide in grain boundaries and that if some ferrite was present carbide was precipitated in it rather than in the grain boundaries. Magnetic tests were used to determine the amount of ferrite present after various heat treatments. 14 references. JLG (4)

Metal Wear and What It Costs. W. C. Rueckel. *Ceramic Age.* Vol. 21, Jan. 1933, pages 9, 25. Investigations made on cost of metal replacements in tools and equipment in manufacture of bricks; they are tabulated for 1000 bricks produced and amounted to 18.6 cents total. It was found that resistance to wear of steels increases with their Brinell hardness and that extreme hardness showed better results than extreme abrasive resisting quality, and chilled Fe was better than unchilled Fe. Ha (4)

Corrosion of Stainless Steels. Application to Cleaning. (Corrosion des aciers inoxydable. Application au décapage.) J. Pomey, P. Voulet & G. Very. *Chimie et Industrie,* Vol. 27, Special Number, Mar. 1932, pages 366-389. Method of cleaning is carried out in 3 operations for making the tests: 1. Dissolving the Cr and Fe oxides by means of H_2O, alkalies, and caustics. 2. Dissolving the Ni oxides by means of HCl and additions of anti-corrosives. 3. Preparation of a shiny surface which will present a high resistance to corrosion in a suitable chlor-nitric mixture. Study was made to determine resistance of stainless steels to acids. Theory on which research was based is modern electrolytic one. Effect of salt in particular was noticed. Corrosion attack can be regulated and deterred by 2 means: adjustment of the potential of the passive metal, and hindrance of the formation of nascent hydrogen. MAB (4)

Rules for Guiding Corrosion Research. Correspondence from A. Portevin. *Metal Progress,* Vol. 22, Aug. 1932, pages 50-51. Summary of present knowledge of factors influencing corrosion resistance and research is presented. WLC (4)

Remarks on the Experimental Characterization of the Dissolution of the Metals by Chemical Reagents. (Remarques sur la Caracterisation experimentals de la Dissolution des Metaux par les Reactifs Chimiques.) A. Portevin & P. Bastien. *Genie Civil,* Vol. 100, June 4, 1932, pages 559-563. Apparatus of Thyssen-Bourdouxhe for determination of corrosion by loss of weight is described and influence of purity of metal, velocity of corroding agent, its concentration and surface conditions investigated. Results are shown in diagrams; conclusions are not drawn but only complexity of corrosion phenomenon is pointed out. 6 references. Ha (4)

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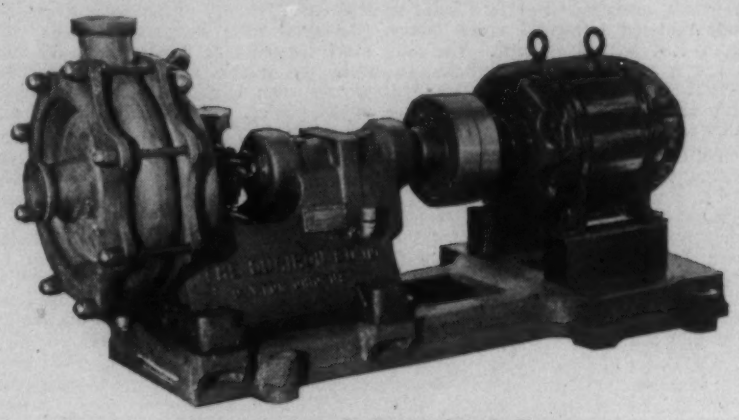

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STRUCTURE OF METALS & ALLOYS (5)

Metallography & Macrography (5a)

Structure of Polished Solids. L. HAMBURGER. *Nature*, Vol. 130, Sept. 17, 1932, pages 435-436. The carefully polished surface films of crystalline materials—prepared and kept at temperature far below the m.p.—consist of lamellae of levelled crystallites of non-microscopic dimensions which show a frequency distribution of particle size. These films ordinarily pass into the core material via a transition layer of relatively great thickness, along which the structure and texture show a continuous change. The nature of polished surfaces is, moreover, complicated as a consequence of its general physical metastability; further, through the adsorption of foreign substances, and the presence of more or less disturbed boundaries of contact between the minute particles. Kz (5a)

Nature of the Two Martensites. Correspondence from KOTARO HONDA & ZENJI NISHIYAMA. *Metal Progress*, Vol. 22, Nov. 1932, pages 46-47. Martensite in a freshly quenched steel is a solid solution of C in Fe. Alpha martensite has a body centered tetragonal space lattice, the axial ratio increasing linearly from 1.03 to 1.07 with C content. The same steel tempered at 250° F. for 30 minutes has a slight increase in hardness, while the volume and electric resistance decrease. The last 2 properties are still greater than ferrite. This is beta martensite which has a body centered cubic space lattice. Its lattice constant and breadth of spectral lines increase with carbon content. WLC (5a)

Solubility of Cadmium in Zinc at Room Temperature. (Über die Löslichkeit von Kadmium in Zink bei Raumtemperatur.) M. STRAUMANIS. *Metallwirtschaft*, Vol. 12, Mar. 31, 1933, pages 175-176. Alloys of very pure Zn with small amounts of Cd were prepared and cooled from melt to room temperature in 6 to 8 hours. By deep etching layers of Cd rich constituents were found in all alloys, showing that solubility of Cd in Zn at room temperature is less than .1% by weight. These results are confirmed by effect of small Cd additions on solubility in acid of Zn alloyed with Au, Cu or Ag. Apparently conflicting results of Boas obtained on samples prepared according to procedure of Czochralski were due to cooling wire samples too rapidly, producing supersaturation of Cd. 6 references. CEM (5a)

The Magnetic Susceptibility of Several Systems of Binary Alloys. YOSOMATSU SHIMIZU. *Science Reports of Tohoku Imperial University*, Vol. 21, Dec. 1932, pages 826-850. Relation of magnetic susceptibility and concentration of binary alloys forming a continuous solid solution was investigated in the systems Au-Ag, Au-Cu, Sb-Bi and Pt-Pd. As absorbed gases exert a conspicuous influence on the susceptibility they must be expelled by treatment of the metals in a vacuum. The curve of susceptibility-concentration can be calculated from the additive law; the deviations found by experiment were only less than 1%. The results for the various systems are all shown in curves and tables. Ha (5a)

The Effect of Addition Elements on Allotropy of Iron. (De l'effet des éléments additionnés sur polymorphisme du fer.) V. N. SVETCHNIKOV. *Revue de Métallurgie*, Vol. 30, May 1933, pages 200-211. All equilibria diagram curves for Fe alloys can be expressed as equations of second order. (Translation from *Domez*, No. 8, 1932.) JDG (5a)

Importance of Structure for Permanent Deformation of Crystals. (Die Bedeutung der Struktur für die bleibende Formänderung von Kristallen.) ERICH SEIDL. *Mitteilungen der deutschen Materialprüfungsanstalten*, Sonderheft 21, 1933, pages 46-49. Irregular fracture is seldom observed in crystals. Experiments are described which show that structure of crystal generally causes regular forms in deformation and fracture due to overstresses. Photographs and diagrams illustrate the mechanism of fracture. Ha (5a)

A Microscopic Study of the Decomposition of the β Phase in the Copper-aluminum System. CYRIL STANLEY SMITH & W. EARL LINDLIEF. *American Institute of Mining & Metallurgical Engineers, Technical Publication* No. 493, Feb. 1933, 39 pages. Eutectoid temperature of system Cu-Al was located at 570° ± 1° C. by quenching experiments and electric resistance-temperature curves. Rates of decomposition of β phase below eutectoid temperature were determined from microstructures of samples rapidly cooled to various temperatures and then held at the temperature for various times. Alloy used contained 11.87% Al. Immediately below the eutectoid temperature the transformation did not begin during the first hr. and 10 hr. were required for it to go to completion. The rate of transformation was greatest at 535° C., being completed in 7 min. At 400° C., 5 days were required to complete the transformation. The microstructures of samples held below 400° C. could not be interpreted with certainty. At 535° C. and below an unstable phase, designated as β', formed, and α needles formed rapidly from this component. The amount of free α increased as the temperature of transformation was lowered. Microstructures of the quenched and reheated samples were also studied. X-ray patterns indicated that the α' formed at the low temperatures contained more Al than is indicated by the equilibrium diagram. Hardness measurements are also given. A theory is advanced to explain the formation of free α particles in an alloy that should consist of the eutectoid with a small amount of free δ. 22 references. JLG (5a)

Phosphorus-Selenium System. (Das System Phosphor-Selen.) P. LUCOCK ROBINSON & WM. E. SCOTT. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 210, Jan. 1933, pages 57-66. Se dissolves in molten P below 50° C. by forming solid solutions. A phosphor-selenide is formed, very probably P_4Se_3 at 130° C. The determination of the diagram of state is difficult; the tests are described. Ha (5a)

Structure & X-Ray Analysis (5b)

Etch Pits in Iron. Their Use in Determining the Orientation of Iron Crystals. DANA W. SMITH & ROBERT F. MEHL. *Metals & Alloys*, Vol. 4, Mar. 1933, pages 31-32, 36. 9 references. By electrolytic etching with a copper-ammonium chloride solution authors produce a shallow crystal in which angle between etch pit sides and surface can be estimated by eye to about ± 10°. A stereographic projection is made with the surface of polish as projection plane. On projection are plotted radii drawn perpendicularly to traces (directions taken by intersections of the etch pit sides with the surface of polish) of the etch pit sides in the surface of polish. The projections of the poles of the etch pit sides will lie upon these radii. The approximate number of degrees along a radius from the center of the projection to the pole is given by the estimated angle between the corresponding pit side and the surface of polish. A standard projection is then rotated by means of a stereographic rotation net so that the (110) poles fall on or very near to the radii and within 20° of the approximated pole positions. The experiments agreed very closely with independent X-ray determinations. WLC (5b)

X-Rays and New Methods. G. SHEARER. *Discovery*, Vol. 13, June 1932, pages 189-192. Use of X-rays in industrial research has revealed important new facts about many materials in common use and has thus opened way for new methods of manufacture. Advantageous use of X-ray methods in fields of metallurgy is emphasized and some characteristic applications are discussed referring to solubility of Al in Cu, phenomena occurring in tungsten magnet steel on heat-treating at 900° and 1200° C. respectively, effect of cold working (cold-drawn Al-wire), crystal size of metallic Cr and electro-deposited metal. WH (5b)

Atom Arrangement and Magnetic Behavior in the Systems Copper-Gold, Copper-Palladium, and Copper-Platinum. (Atomordnung und magnetisches Verhalten in den Systemen Kupfer-Gold, Kupfer-Palladium und Kupfer-Platin.) H. J. SEEMANN. *Zeitschrift für Metallkunde*, Vol. 24, Dec. 1932, pages 299-301. Atomic susceptibility is most useful property in study of magnetic properties of alloys. The diamagnetic susceptibility of solid solutions of Cu and Au of random distribution of atoms plotted against atomic % shows a departure from the rule of mixtures in the direction of greater diamagnetism, indicating the presence of chemical affinity effects. The formation of the compounds Cu_3Au and CuAu with regular atomic arrangements (by annealing at low temperatures) is accompanied by a 20% increase and a 20% decrease, respectively, in atomic diamagnetic susceptibility. Solid solutions of Cu-Pd and Cu-Pt of random distribution of atoms show an increase in atomic diamagnetic susceptibility up to 25 atomic % even though both Pd and Pt are paramagnetic. The formation of Cu_3Pd and Cu_3Pt is accompanied by an increase in atomic diamagnetic susceptibility as with Cu_3Au, 50% for Cu_3Pd and 25% for Cu_3Pt; no observations were made on CuPd and CuPt because of the disturbing effect of ferromagnetic impurities. RFM (5b)

Lattice Dimensions in Copper-Silver Alloys. HELEN DICK MEGAW. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science*, Vol. 14, July 1932, pages 130-142. Cu-Ag alloy specimens of varying percentages were prepared and heat treated. X-ray photographs were taken of these specimens. Tables show measurements of photographs and spacings calculated from them. Graphs show solubility of Ag in Cu and Cu in Ag. RHP (5b)

Roentgenographic Investigations of Metallic Lanthanum, Cerium and Neodymium. (Roentgenographische Untersuchungen des metallischen Lanthans, Cers und Neodyms.) L. L. QUILL. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 208, Oct. 1932, pages 273-281. Following determinations were made: La crystallizes hexagonally, $a = 3.75_4 \pm 0.010$ A.U., $c = 6.06_3 \pm 0.030$ A.U., density 6.194. Ce has a cubic face-centered structure of a length of side of 5.143 ± 0.004 A.U., density 6.799. Nd is hexagonal with $a = 3.675 \pm 0.010$ A.U., $c = 5.88_0 \pm 0.030$ A.U., density 6.991. Ha (5b)

The Crystal Structure of Yttrium. L. L. QUILL. *Zeitschrift für organische und allgemeine Chemie*, Vol. 208, Sept. 1932, pages 59-64. Metallic Y could be produced with a purity of 99.5%. It is a coarse, gray powder. The structure was determined by the Debye-Scherrer method and gave $a = 3.663 \pm 0.008$ A.U., $c = 5.814 \pm 0.012$ A.U., $c/a = 1.588$. The roentgenographic density was 4.34. Ha (5b)

Lattice Dimensions of Niobium, Tantalum and a Few Niobates and Tantalates. (Ueber die Gitterdimensionen des Niobs, des Tantals and einiger Niobate und Tantalate.) L. L. QUILL. *Zeitschrift für anorganische und allgemeine Chemie*, Vol. 208, Oct. 1932, pages 257-272. Nb and Ta were investigated by X-ray spectrographic methods. It was found:

	Nb	Ta
Lattice constant	3.299 ± 0.002 A.U.	3.298 ± 0.002 A.U.
Roentgenographic density	8.575	16.69
Atomic weight (1932)	93.3	181.4
Atomic radius (8-coordination)	1.429	1.428

The same figures were determined for $NaNbO_3$, $NaTaO_3$, $KNbO_3$ and $KTaO_3$. These determinations were made to facilitate the difficult separation of rare earth metals. Ha (5b)

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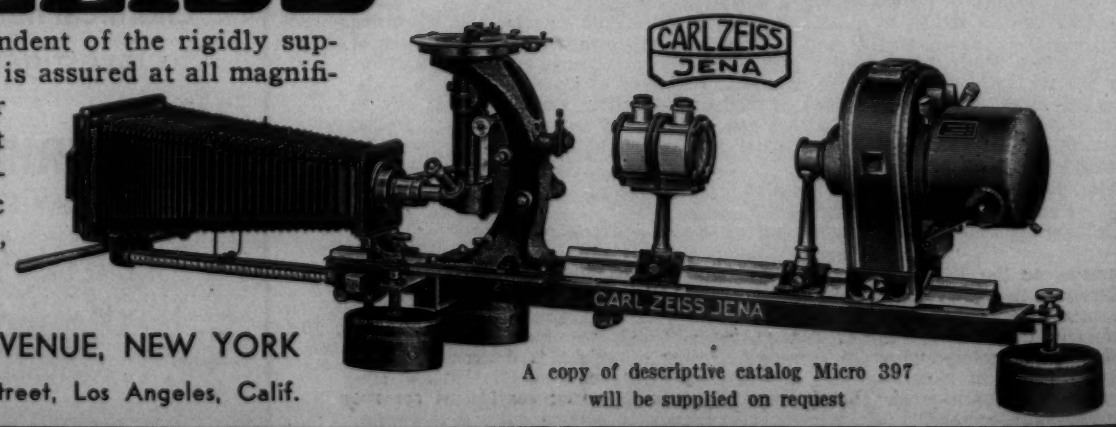

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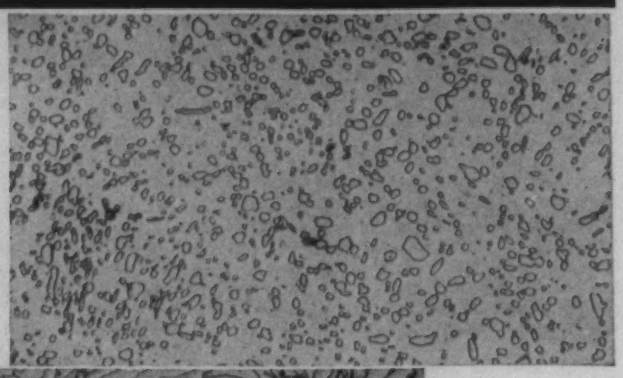

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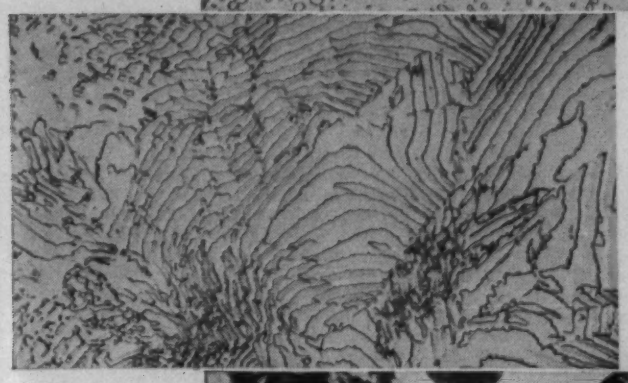

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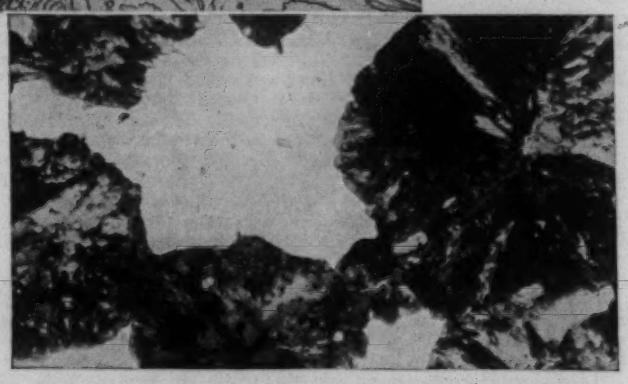

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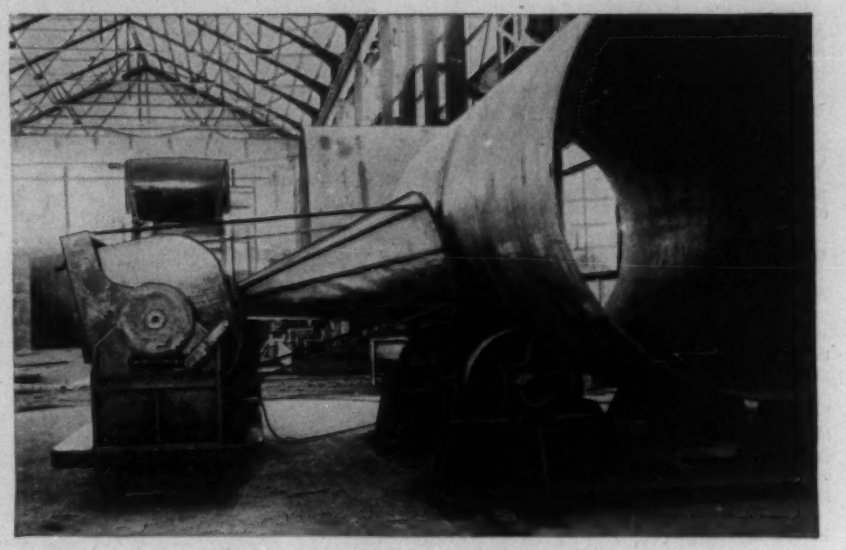

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Testing Riveted Joints of Cromansil Steel. INGE LYSE. *Engineering News-Record*, Vol. 110, May 11, 1933, pages 584-585. Low-alloy steel, Cr 0.40-0.60, Mn 1.10-1.40, Si 0.70-0.80, and C to suit, developed for structural purposes, was investigated in regard to riveted joints. 2 butt joints and 2 lap joints using both plates and rivets of this material were tested. One of each kind of joint was riveted with an air hammer, the other by hydraulic pressure. Strains and slip were measured. Test results are completely summarized in tabulation. CBJ (6)

Test Methods for Cast Iron. (Les Méthodes d'Essai des Fontes.) Results obtained by the Belgian Foundry Association following the program of DR. MEYERSBERG. *Bulletin de l'Association Technique de Fonderie*, Vol. 16, Aug. 1932, pages 448-457. Paper presented at the World Foundry Congress, Paris, Sept. 1932. 7 German and 4 Belgian cast irons were tested. Results of bending, tensile, shear and hardness tests are given in tabular form without comments or conclusions. WHS (6)

The Determination of the Depth of the Case of Case-Hardened Pieces. (Ueber die Bestimmung der Einsatztiefe bei im Einsatz gehärteten Werkstücken.) WALTER MELLE. *Werkstattstechnik*, Vol. 26, Jan. 15, 1932, pages 21-24. See *Metals & Alloys*, Vol. 4, May 1933, page MA 144. RFV (6)

Testing for Physical Characteristics of Nitrided Steels. WM. J. MERTEN. *Fuels & Furnaces*, Vol. 10, Jan. 1932, pages 33-37. Different methods of hardness testing by Rockwell, Brinell and scleroscope are explained and examples given. Ha (6)

The Haigh Alternating Stress Testing Machine. P. FIELD FOSTER. *Machinery*, London, Vol. 40, Aug. 18, 1932, pages 621-624. Illustrated description of machine designed in two sizes for load ranges of 1½ tons and 6 tons respectively Advantages claimed are: uniform distribution of stress across section, greater length of test piece, possibility of applying stress cycles of unequal + and — limits. Machine can also be used for fatigue tests. Kz (6)

Yield Point with Restricted Deformation. (Die Fliessgrenze bei behinderter Formänderung.) PRAGER. *Forschung (Zeitschrift Technische Mechanik und Thermodynamik)*, Vol. 4, Mar./Apr. 1933, pages 95-97. The elastic surpassing of the yield point of steel is compared with the delay of boiling of liquids. The results of a theory on plastic bending of straight bars resulting from this opinion are applied to the tests of Thum and Wunderlich as previously described in *Forschung*, Vol. 3, Nov./Dec. 1932, page 261. GN (6)

Contribution to Acoustic Materials Testing of Steel Bars, in particular for Chimes. (Beitrag zur akustistischen Werkstoffuntersuchung von Stahlstäben, insbesondere für die Herstellung von Gengspielen.) A. POMP & B. ZAPP. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 15, No. 3, 1933, pages 21-35. It was attempted to find relations between acoustic properties and mechanical or chemical properties of steel bars. Not much could be found. Bars with a good sound had a very fine structure; non-tempered bars give a dull short sound. The quality of tone improves with temperature and duration of tempering. There exists a possibility of measuring small deformations and damping by determining the duration of a sound. Ha (6)

Determining Static and Dynamic Hardness. (Ein Beitrag zur statischen und dynamischen Härteprüfung.) ERNST L. SCHMIDMER. *Forschungsarbeiten über Metallkunde und Röntgenmetallographie*, Folge 5, 1932, 102 pages. Previous work on static and dynamic hardness is reviewed. A group of non-ferrous metals and alloys was used in determining hardness by various methods. With Brinell test "n" in formula $P = ad^n$ was always greater than 2. For impressions made with a cone having a 90° angle "n" was always equal to 2. Depths of impression as well as diameter were determined. Dynamic tests were made with Schwarz machine. Relationship between diameter of impression with static loads and with impact was developed. With impact "n" in the formula is 4.0 for a sphere and 3.0 for a cone. 73 references. JLG (6)

Wear Tests on Machine Tool Guideways Repaired with Gussolite Alloy. G. SCHLESINGER. *Machinery*, London, Vol. 41, Jan. 5, 1933, pages 393-398. New welding process of Klopstock involving a cast iron alloy designated as Gussolite is described. Guideways of a machine tool were repaired with Gussolite and experimented with. Although Brinell hardness between the sound cast iron and the portions of Gussolite differed from 70-80 no measurable wear was detected. Kz (6)

Tension-Elongation-Diagram of Ferromagnetic Materials under very Small Loads. (Ueber das Spannungs-Dehnungs-Diagram ferromagnetischer Materialien bei sehr kleinen Belastungen.) H. KUEHLEWEIN. *Zeitschrift für Physik*, Vol. 13, No. 11, 1932, pages 539-541. Ferromagnetic materials under the influence of magneto-striction show a definite measurable time before they have reached stationary condition for elongation. Diagrams are given for different materials under different tensile stresses. Ha (6)

On a Method of Etching for the Strain Figures of Mild Steel and the Process of Its Failure. MOTOICHI KODAMA. *Journal Society of Mechanical Engineers*, Tokyo, Vol. 35, Sept. 1932, pages 934-939. Paper presented at 2nd General Meeting, Society of Mechanical Engineers, Apr. 7, 1932. Author obtained good results by using $CuCl_2$ and H_2O_2 as oxidizing agents, $C_3H_5(OH)_3$ as inhibiter and HCl as provider of H^+. A titration curve by measuring the electrical potentials of the liquid between Pt and Cu plates at 13° C. is given. Based on the investigation into the failure of mild steel, the strain due to stress is classified as follows: (1) strain due to individual crystal (2) strain due to body or configurated crystals (a) elastic strain (b) plastic strain (c) local strain. The natures of the different strains are discussed with reference to stress-strain diagrams and strain figures. The strain due to individual crystal (1) is difficult to measure, the strain due to (2) which are elastic, plastic and local strains can be shown by a stress-strain diagram. Diagrams included in the paper were obtained by compression tests, using an Amsler 20 ton testing machine supplied with an enlarging apparatus. Kz (6)

Deep Drawing Test. (Die Tiefziehprüfung.) A. KRECEK. *Metallwirtschaft*, Vol. 12, Apr. 7, 1933, pages 189-192. A rapid test for soft sheet and strip metals, which will determine their suitability for deep drawing operations, is very desirable. None of many methods which have been proposed is ideal, but Erichsen test comes closest to giving results comparable with performance of material in production. Test determines deep drawing properties of material itself under definite conditions. Instead of using depth of draw in mm. it is proposed to use a percentage figure which is independent of thickness of sheet. Depth-thickness curves for several metals of 100% ductility were obtained after tests on several thousand samples of material used in production. From these depth-percentage curves for various thicknesses were desired. Influence of test piece width was also investigated. Width has a greater influence on the thicker than on the thinner materials. 22 references. CEM (6)

Method for Determination of Stresses in Large Castings and Forgings. (Verfahren zur Ermittlung von Eigenspannungen in grossen Guss- und Schmiedestücken.) *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Apr. 2, 1933, pages 196-197. Description of method and apparatus for determination of stresses in large castings and forgings. Method is briefly as follows. Notches of variable length and thickness are turned in the piece to be tested, thus removing stressed areas and interrupting the flow of force of the stresses. The stresses remaining in the parts not machined effect small changes of shape which are then measured with a fine measuring device. Conclusions can then be drawn on type, direction and intensity of the stresses remaining in the parts not machined and those destroyed in the machined sections. GN (6)

Welded Boiler Drum Tested to Destruction. *Steam Engineer*, Vol. 2, Jan. 1933, pages 173-174. Pressure of 750 lbs./in.^{2} was applied 6 times/min. for 320,000 applications before a fine fracture showed in a welded boiler drum. This equals 1,060 yrs. of normal use. Hydraulic pressure of 48,600 lbs./in^2 caused failure of the welded drum. Leakage developed at 27,000 lb. in the riveted drum, and it was impossible to exert a stress of more than 43,400 lbs./in.^{2} AHE (6)

Apparatus for Static and Dynamic Tensile and Compression Tests. *Engineering*, Vol. 135, Apr. 21, 1933, pages 432-433. Describes equipment made by Alfred J. Amsler, Switzerland, for John A. Roebling's Sons' Co. Apparatus can be used for both static and dynamic tests, in tension as well as in compression, and using either usual short test piece or specimens up to 12 ft. in length. LFM (6)

Measurements of the Kinetic Loads on Colliery Winding Ropes. S. M. DIXON & M. A. HOGAN. *Safety in Mines Research Board, Great Britain, Paper* No. 78, 1933, 28 pages. Stresses in wire ropes are measured. AHE (6)

Elongation Line Method as Means for Determination of Distribution of Stress deciding for Safety against Fracture in Alternating Stresses. (Das Dehnungslinienverfahren ein Mittel zur Bestimmung der für die Bruchsicherheit bei Wechselbeanspruchung massgebenden Spannungsverteilung.) OTTO DIETRICH & ERNST LEHR. *Zeitschrift Verein deutscher Ingenieure*, Vol. 76, Oct. 8, 1932, pages 973-982. Greatest stresses in a machine part are often many times value calculated by usual formulas and can be actually measured only by very tedious methods. A new method has been developed by Maybach Motor Works which shows directly and in simple manner places where extraordinary stresses occur. To this end the part in which the stress distribution is to be determined, is covered with a special varnish which adheres very well to the surface, and has a considerably higher elasticity modulus than the material of the part; for each material exists a special varnish. If the part is now subjected to stresses exceeding a certain limit cracks or fissures form in the varnish which are called "elongation lines." They always take place perpendicularly to direction of greatest tensile stress. They show themselves at a stress which is far below the elastic limit as it really corresponds to practical conditions. The places of the surfaces where the cracks occur are therefore those of the peaks of stresses. As the distribution of the stresses is greatly dependent on the shape of the piece, drillings, holes, etc., the taking of such elongation line picture gives a good immediate indication of the behavior of the part under actual conditions. The measuring method and evaluation of results is described and several examples given illustrating the procedure. 15 references. Ha (6)

Detection of Cracks in Bus Parts Facilitated by Magnetic Tester. W. J. CUMMING. *Transit Journal*, Vol. 77, Apr. 1933, pages 115-116. Inspection method consists of magnetizing part inspected and then dusting over it an iron powder known as "Magnaflux," which sticks to sharp edges adjacent to a crack. Equipment for making this inspection is described. CBJ (6)

Laboratory Investigations are Secondary to Service Tests. J. L. MCCLOUD. *Metal Progress*, Vol. 22, Aug. 1932, pages 35-37. Examples of discrepancies between laboratory and service results in automobile industry are cited. WLC (6)

Vibration in Solid Rods. G. S. FIELDS. *Nature*, Vol. 130, July 23, 1932, pages 130-131. For investigation of vibrations in metal rods the following method has been devised. One end of the rod is tapped with a small hammer and to make visible the train of waves which occur as result of the impact, to the other end of the rod a piezo-electric crystal is cemented, which converts the vibrations at that point to an alternating voltage. This voltage is amplified and impressed on a cathode ray oscillograph, connected to a synchronized time-axis device. Although in most cases the waves are quite complex, it is possible to pick out vibrations of different types. By measuring the decrement of a wave, the coefficient of solid viscosity corresponding to that frequency may be calculated with more accuracy than has been possible with previous methods. Kz (6)

Impact Tests in Specifications for Soft Steel. Correspondence from FEDERICO GIOLOTTI *Metal Progress*, Vol. 22, Dec. 1932, pages 48-49. Improved travel conditions on Italian railways are due to technical improvements especially in specifications for metals. The controversy which arose on introduction of the impact test led to researches by the producers and engineers. As a result the impact test is now accepted, but with low limits. The test results using 2 and 3 mm. deep notches indicate the need for an international standard size notch for impact test bars. WLC (6)

Analysis of B. C. I. R. A. Results Obtained by Form-Factor Method. A. C. VIVIAN. *Metallurgia*, Vol. 7, Apr. 1933, pages 173-174. Transverse tests on bars of several sizes and dimensions and tensile tests on the same iron are given. These are alleged to prove that formulae developed by the author for calculating stresses are correct and that gray Fe has uniform properties. JLG (6)

New Magnetic Sheet-Testing Method. (Ueber ein neues magnetisches Blechprüfverfahren.) P. C. HERMANN. *Zeitschrift für technische Physik*, Vol. 13, No. 11, 1932, pages 541-549. A magnetic measuring instrument on the electrodynamic principle is described with which d. c. magnetization curves and a. c. loss measurements of sheet strips can be taken. Instrument is located very close to surface of sheet so that deflection of moving system is proportional to field strength in d. c. measurements and proportional to loss in a. c. measurements. Weight of sample required is only 50-200 g. as compared with 1 kg. in the usual Epstein method. Theory of method, precautions to take, sources of errors and construction of instrument are discussed. Ha (6)

Experimental Errors or Fluctuation in Hardness? Correspondence from E. G. HERBERT. *Metal Progress*, Vol. 22, Aug. 1932, page 52. Discussion of factors influencing results obtained in recent experimental work on magnetic hardening of alloys. WLC (6)

Photo-Elastic Stress Investigations on Drilled Tensile Bars and on Rivet Holes. (Polarisationsoptische Spannungsuntersuchungen am gelochten Zugstab und am Nietloch.) HENNIG. *Forschung (Zeitschrift Technische Mechanik und Thermodynamik)*, Vol. 4, Mar./Apr. 1933, pages 53-63. State of stress in bored tensile bars was studied by photoelastic methods. The development of the state of stress was determined from the theoretically approachable case of an infinitely small hole. The changes of the state of stress due to larger holes were studied in detail. Of practical interest is the curve of stress increase in the smallest cross-section in relation to the diameter of the hole. For this curve an approximate formula is given for the case that the diameter of the hole is smaller than half the width of the test bar. GN (6)

Deformations of Continuous Steel Beams. (Die Formänderungen einfacher und durchlaufender Stahlträger.) FRIEDRICH HARTMANN. *Schweizerische Bauzeitung*, Vol. 101, Feb. 18, 1933, pages 75-79. Method for determining stress and deformation of elastic-plastically bent steel beams is described. Experiments show the usefulness of the method even with heavy deformation. GN (6)

Constructional Tests on Mild-Steel Rolled Sections with Electrically-Welded Joints. B. P. HAIGH. *Engineering*, Vol. 135, Apr. 21, 1933, pages 442-443. Includes discussion. Short abstract of paper read before the Institution of Naval Architects, Apr. 5, 1933. LFM (6)

What is this thing called Fatigue?

These abstracts are prepared in cooperation with the A. S. T. M. Research Committee on Fatigue of Metals.

Elastic Defects of Metals and Decay of Torsional Oscillations. (Les défauts d'élasticité des métaux. Amortissement des oscillations de torsion). LOUIS FILLIATRE & PIERRE VERNOTTE. *Comptes Rendus,* Vol. 196, May 8, 1933, pages 1374-1376. To obtain probable results for metals at high temperatures the authors worked with metals which are viscous at ordinary temperatures. The experiments were performed on a 3 m. length of fuse-wire extended for 8 hours by the oscillating mass which increased the length of the wire by 20 cm. The decay constant for the torsional oscillations is obtained by usual methods and for various initial displacements. Considerable zero-displacements were recognized and qualitatively determined. OWE (6f)

Fatigue Testing of Materials. P. FIELD FOSTER. *Machinery,* London, Vol. 40, June 30, 1932, pages 404-407. In introduction, development of fatigue failures and their characteristics are dealt with. After defining conceptions of fatigue range and endurance, author chooses 2 methods of testing (1) Wöhler test, in which a rotating bar is bent, (2) Subjecting specimen to alternate tension and compression, and describes arrangements of experiments. Results are discussed and endurance curves for several kinds of steel are given. One table demonstrates effect of surface finish on endurance of steel in order to prove importance of degree of finish. Length of time required to carry out fatigue tests being a serious obstacle author proposes employment of machines capable of dealing with several specimens at same time and running at higher speed, say at 10,000 r.p.m. Kz (6f)

Endurance Limit Under Multiaxial Stress Conditions. (Zur Frage der Ermüdungsfestigkeit bei mehrachsigen Spannungszuständen.) K. HOHENEMSER & W. PRAGER. *Metallwirtschaft,* Vol. 12, June 16, 1933, pages 342-343. Tests were made on .10 C steel, cold drawn and annealed at 930°-940° C., the test piece being in the form of a tube of irregular outside diameter. The test piece was gripped at the ends for the tensile stress and in the middle for the torsional stress. The results of several endurance limit tests under alternating torsional and alternating or static tensile stress are given in 2 curves. 6 references. CEM (6f)

Investigations on Fatigue of Metals. (Recherches sur la fatigue des métaux.) M. CAZAUD. *Chimie et Industrie,* Vol. 27, Special Number, Mar. 1932, pages 390-392. Studies of author to determine fatigue limit of metals show that a knowledge of this property is absolutely necessary to employment of metals for industrial purposes. Method is very clearly given. Tests were made on steels with 0.1% C, with 0.28% C, and with 0.4% C, 2.7% Ni, and 0.85% Cr, and also with 0.65% C and 22.95% Ni. Fatigue limits are given for these steels. Degree of fatigue, which is practically constant through central portion of test-piece, is calculated by formula for cantilever deflection; test is repeated on a number of pieces with successively decreasing loads, total number of alternating stresses required to break the test-piece being noted in each case. Maximum load, in kg./mm.^{2}, which does not break the piece after 100,000,000 alternations, is the practical fatigue limit. The tests closly approximate actual conditions, and hence the data are valuable for materials to be used in machine parts. The method described is practically that which has been in use in the United States, England and Germany for several years. MAB (6f)

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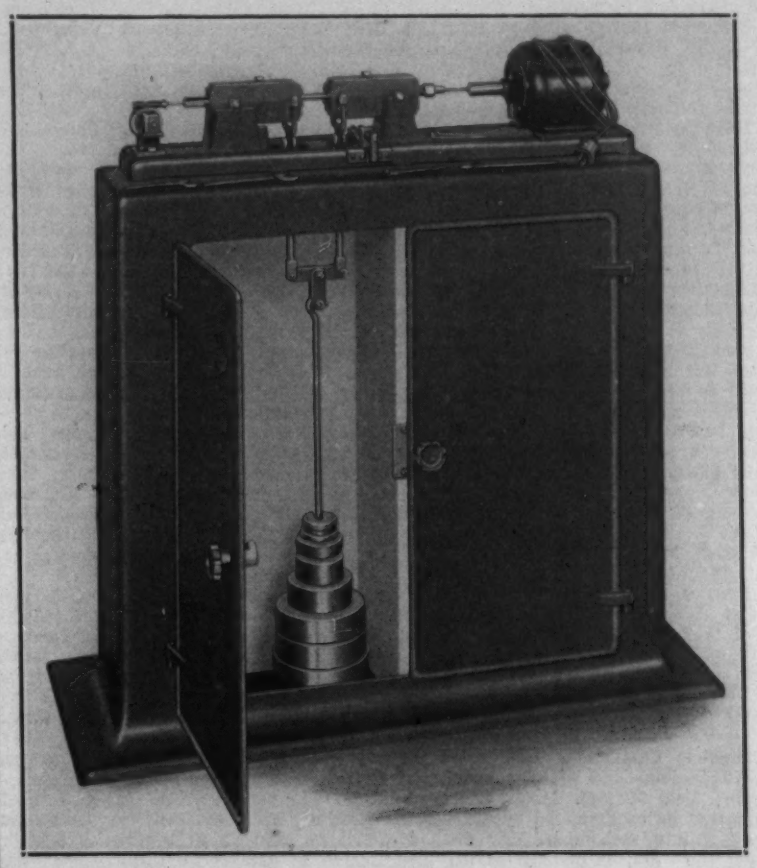

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ELECTRO-CHEMISTRY (7)

Electroplating (7a)

Causes of Formation of Spots on Silver Ware. (Ursache zu Fleckenbildungen an Silberwaren.) HANS HORNAUER. *Deutsche Goldschmiedezeitung,* Vol. 36, Apr. 8, 1933, page 155. Discussion of various reasons for spots in plating silver ware. GN (7a)

Production of Chromium Plated Wire Products (Herstellung verchromter Drahtgegenstände). *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, May 14, 1933, page 282. Brief description of a new method for Cr plating such products. The products are first Cu coated then drawn several times through polished dies to close pores and finally Cr plated. Tightly adhering rust proof coatings are thus obtained. GN (7a)

The Protection of Metal Surfaces against Corrosion. VII. Nickelplating. (La Protezione delle Superficie Metalliche contro la Corrosion. VII. Nichelatura.) GIACOMO BARGELLESI. *L'Industria Meccanica,* Vol. 14, Nov. 1932, pages 685-690. Discusses preparation of the piece for Ni plating, single deposits, multiple deposits with other metals between Ni deposits, electrolytic baths and their compositions, and degreasing methods. Ha (7a)

Chromium Plating of High Luster in Cold Baths. (Hochglänzende Verchromung in kalten Bädern.) *Emailletechnische Monatsblätter,* Vol. 9, Apr. 1933, pages 30-31. Considers application of a cold Cr plating bath, called "Panzerchrombad." Advantages: Elimination of the poisonous Cr fumes and higher current efficiency amounting to about double that of usual Cr plating baths. GN (7a)

Throwing Power of Chromic Acid Solutions. (Das Streuvermögen der Chromsaurebäder.) K. ALTMANNSBERGER. *Chemiker-Zeitung,* Vol. 57, Mar. 15, 1933, pages 203-204. Throwing power of CrO_3 solutions is very poor, about 1/20 that of Ni solutions. The current density being the same it is better in dilute than in concentrated solutions. It is better with low acid concentration, low temperature, high current density and low Fe content. Best results are obtained with about 350 g. CrO_3/l. The racking is important, profile anodes and a Ni undercoating are desirable. CEM (7a)

Chromium Plating. C. CAMPBELL. *Automobile Engineer,* Vol. 22, Oct. 1932, page 462. Review of recent developments in process of electro-deposition. Originally Cr was deposited on Cu. Best results are now secured from a solution of chromic acid which contains a small proportion of Cr sulphate. Deposition of Cr of this mixed solution theoretically comes from 2 sources. A film of what is known as basic chromic chromate is formed on cathode with a very weak solution in contact with the cathode, followed by partial reduction of chromic ions to chromous ions whereby deposition of Cr occurs from both chromic and chromous ions. Reaction is accompanied by discharge of hydrogen. This impairs mechanical strength of Cr plating. Important factors are ratio of chromic acid to Cr sulphate, temperature, and cathode current density. A successful Cr plating solution has been made up of a 25% solution of chromic acid and 0.3% of Cr sulphate, used at 20° C. RHP (7a)

Anodes in Chromium Plating Baths. (Anoden in Verchromungsbädern.) G. ELSSNER. *Oberflächentechnik,* Vol. 9, Sept. 6, 1932, pages 181-183. Experiences with Cr anodes and other metals are reviewed. Although the former at first gives a good Cr output it fell to less than 2% after 130 hrs. due to dissolved Cr metal not being entirely deposited at cathode and thus reducing conductivity of bath considerably. Deposits, at first bright, became a dull gray later. A chart is given from which the cathodic current density can be taken which is best for obtaining a glossy deposit. The best material for anodes at present is Pb. Several special electrodes offered in the market have proved of no particular value. Ha (7a)

Chromium Coatings of High Corrosion and Heat Stability. (Chromüberzüge von hoher Korrosions- und Hitzebeständigkeit.) G. HUTH. *Emailletechnische Monatsblätter,* Vol. 9, Feb. 1933, pages 13-14. In certain cases the spalling of plating can be counteracted by heating the articles plated, thus causing the metals to diffuse into each other. This method cannot be used on Cr plating. Before Cr plating the metal is first Ni plated then treated in pure H at 1100°-1300° C., thus bringing about diffusion of the metals. Pieces thus treated can be machined to a certain extent. By this method Cu can be Cr plated. GN (7a)

Chromium Plating. (Etwas aus der Praxis für die Praxis.) HANS HORNAUER. *Emailletechnische Monatsblätter,* Vol. 9, Mar. 1933, pages 20-22. Gives practical hints on proper Cr plating with special reference to plating baths used. Defects frequently encountered are considered. GN (7a)

Chromium Plating Literature. L. H. DECKE. *Platers' Guide,* Vol. 29, Jan. 1933, pages 19-20; Feb. 1933, pages 19-20; Mar. 1933, pages 19-20. Applications. WHB (7a)

Effect of Hydrogen-Peroxide in Chromium Bath. (Ueber die Wirkung von Wasserstoffsuperoxyd in Chrombad.) E. RAUB & K. BIHLMAIER. *Mitteilungen des Forschungsinstituts und Probieramts für Edelmetalle,* Vol. 6, Dec. 1932, Jan. 1933, pages 85-99. Extensive experiments have shown that H_2O_2 can be used with advantage as an addition to chromium plating baths in all cases where an increase in content of chromic chromate is desired as it transforms almost immediately with chromic acid into chromic chromate. Chromic salt increases range of bright plating as long as it does not exceed a certain amount with respect to chromic acid. Best ratio of chromic acid to H_2SO_4 does not greatly depend on content of chromic chromate; throwing power of very rich chromic acid baths is greatly improved by increasing H_2SO_4 content to 1.5-2.2% of the chromic acid. Bath resistance is not perceptibly influenced by a content of chromic chromate up to 7-10% of chromic acid. Test results are given in curves and described in detail. Ha (7a)

Gray Chromium Plating (Grauverchromung). R. JUSTH. *Oberflächentechnik,* Vol. 10, Feb. 7, 1933, pages 27-28. Method of gray-chromium plating which was extensively used before bright-plating came into use, is recalled; it was used to give the base metal surface hardness and corrosion resistance. Contrary to present methods the bath was cooled, the working temperature is 15°-18° C. at about 5 amp./dm.^{2}; the thickness of the layer is about 0.01-0.02 mm., time about 30-60 min. The electrolyte contained 500-600 g. chromic acid/liter. Great amount of H absorbed in this deposit was removed by a treatment with a high-frequency current in a vacuum. Gray coating was sometimes brightly polished which required special skill. Ha (7a)

The Electrodeposition of Cadmium from Cadmium Sulphate Solutions. S. WERNICK. *Transactions of the Electrochemical Society,* Vol. 62, Sept. 1932, pages 27-38; *Metal Industry,* London, Vol. 41, Nov. 18, 1932, page 500. Experiments revealed that the pH of a simple solution of $CdSO_4$ rises rapidly with progressive deposition, effective means for maintaining a constant pH are necessary; to obtain a satisfactory deposit an optimum range is from 5 to 5.7. The best buffering effect among several additions studied was exerted by a mixture of H_3BO_3 and NaCl. The crystal structure of the deposit is not appreciably influenced by temperature until temperature exceeds 50° C.; the electrolyte should be kept between 40° and 50° C. By variation of pH, current density and bath temperature, however, no such uniform deposits of refined grain could be obtained as was possible with cyanide solutions; in order to obtain a deposit of this type a colloidal "addition agent" was required, for instance, dextrin gelatine and peptone. 14 references. Ha (7a)

Practical Experiences in Cadmium Plating. (Praktische Erfahrungen beim Verkadmen.) H. KORTE. *Zeitschrift für wirtschaftliche Fertigung,* Mar. 1932, section C M, page 1. Electrolytic Cd coats are superior to galvanic or hot galvanized Zn coatings. Even thinnest Cd layers (.005 mm.) give an almost complete corrosion protection. Cd coatings before Ni plating are less sensitive to rusting than pure Ni platings. A disadvantage of Cd plating is the low hardness of Cd. This disadvantage can be eliminated by Cd-Ni-Cd triple plating. Plating baths and working methods are described. GN (7a)

Modern Chromium Plating. (Neuzeitliche Verchromungsanlagen.) W. BIRETT. *Zeitschrift für Metallkunde,* Vol. 24, Dec. 1932, pages 289-296; *Oberflächentechnik,* Vol. 10, Feb. 7, 1933, pages 25-27. Recent trend is to use non-lined iron tanks as experience has shown that Fe is made passive by chromic acid and therefore does not dissolve. Sides are lined with glass plates merely to prevent direct contact with materials to be plated, electrolyte being permitted to touch the walls freely. If bath is heated electrically it should be done with d.c. as a.c. produces induced currents in iron walls which might lead to corrosion. Anodes of hard-lead have proved most successful. Voltage across bath should be 3-5 volt so that current can be exactly adjusted at any load; an average current density is 1000 amp./m.^{2} The electrolyte consists essentially of an aqueous solution of chromic acid with little H_2SO_4 and 3-valent Cr. Baths with weak concentration have usually a good depth action, but stronger concentration assures a better constancy of the bath. The acidity of the bath must be constantly checked in order to assure constant current efficiency; a convenient testing arrangement with auxiliary lead anode is described. The higher the temperature of the bath the greater is the range of brightness, that is the time within which a highly polished deposit is obtained with a given current density. The average current density for ornamental chromium plating at 42°-45° C. is 1000 amp./m.^{2} and yields 0.001-0.002 mm. thickness; thicker layers are of no advantage as they often crack. All metals except light metals can be chromium plated though some offer great practical difficulties. Auxiliary anodes are often employed to obtain uniform coating for very strongly profiled parts. Sources of failure, treatment after plating and the advantages of chromium plating for tools are discussed. Chromium plating has proved to be a perfect protection for corrosion if used over nickel plating. Apparatus for quantity plating is briefly discussed. Ha (7a)

The Electrodeposition of Chromium, Molybdenum and Tungsten. L. F. YNTEMA. *Journal American Chemical Society,* Vol. 54, Sept. 1932, pages 3775-3776. Procedures are given for the electrodeposition of Cr, Mo and W from solutions containing the metal compound and an organic acid. MEH (7a)

Properties Which Characterize Chromium Plating. R. J. PIERSOL. *Iron Age,* Vol. 129, June 23, 1932, pages 1344-1345, 1381. Cr has some unique properties such as diamond-like hardness, adhesion to certain foundation metals, high coefficient of light reflection, low coefficient of friction and high temperature resistance. Best application of hard Cr is under conditions where permissible surface wear is comparable to thickness of deposit. Commercial plates of hard Cr are limited to from 0.001 to 0.1-inch in thickness. In Cr used for abrasive resistance, porosity is of secondary importance. Under certain conditions extremely porous deposit of Cr is caused by entrapped H bubbles. Gives test for porosity. To obtain proper adhesion of Cr to foundation metal, electro-cleaning, usually cathodic followed by anodic, was developed. At temperature of less than 1200° F. Cr will not oxidize. VSP (7a)

Modern Electro-Deposition of Metals. S. COWPER COLES. *Journal Institution of Production Engineers,* Vol. 12, Mar. 1933, pages 79-90. Includes discussion. Modern practice in the electro-deposition of Cu, Fe, Zn, Pb, Ni, Cr and Cd is briefly outlined. Improvements in generators, filters, agitators, and methods of pH control, coupled with appreciation of the importance of rapid circulation in producing smooth deposits, have caused chief advances. Cu sheet can be made with a total energy consumption of 1000 KWH/ton by plating on a revolving steel drum at 200-250 amps./ft.^{2}, and stripping the deposit. Spring-hard material can be made by consolidating the deposit by floating rollers. Cu wire is made by depositing on a mandrel in which a spiral V groove is cut. The crystals in the deposit grow at right angles to the surface and so meet in a line above the apex of the V. The deposit will divide at this point, and can be unwound as a square wire, which only needs a single wire drawing operation for finishing to shape. JCC (7a)

A Study of Strains in Copper Electrolytically Deposited in the Presence of Gelatine. (Etude des tensions dans le cuivre électrolytique déposé en presence de gélatine). P. JACQUET. *Journal du Four Electrique,* Vol. 41, Sept. 1932, pages 341-342. Reprint from *Journal de Chimie Physique,* Vol. 29, 1932. The strains created in electrolytically deposited Cu were studied by conducting electrolysis using as cathode 0.04 mm. thick sheet of Cu. The amount of curvature found after the completion of the operation was used as the criterion. In $CuSO_4$ electrolyte, with pH 0.85, the deposition of Cu always was associated with contraction. With gelatine concentration from 0.5 to 50 mg./l. of the electrolyte the contraction increases pronouncedly. Between 50 and 125 mg./l. the contraction fluctuates together with the appearance of the coating which passes from dull to brilliant. Between 125 and 190 mg./l. the contraction steadily decreases while the deposit remains brilliant. From 190 to 500 mg./l. dilatation proceeds. The deposits remain brilliant up to 250 mg./l., after which they become dull. Aging of gelatine solution has a pronounced effect on the process, Reheating of gelatine before adding it to the bath restores the original properties. JDG (7a)

Adsorption of Colloids by Metallic Surfaces and Its Influence on Adherence of Metallic Deposits (L'adsorption des colloides par les surfaces métalliques et son influence sur l'adhérence des dépots électrolytiques). P. JACQUET. *Comptes Rendus,* Vol. 196, Mar. 27, 1933, pages 921-923. With a Cu cathode in $CuSO_4$ solution the colloids studied fall into 2 groups: those which definitely affect the adherence (proteins, peptones) and those without effect (gums, dextrin). With the active substances, the adherence changes with the concentration, and there exists a minimum concentration below which there is no effect. It is suggested that these results provide a method of studying electrochemically the adsorption of colloids. OWE (7a)

New Platinum Plating Process. *Metal Industry,* London, Vol. 41, Dec. 16, 1932, page 596. An improved Pt plating method by Johnson, Matthey and Co. is briefly described which is particularly adapted for plating cutlery and jewelry to prevent tarnishing. The solution used is not mentioned, Pt plated anodes are employed and current density is from 6 to 8 amp./ft.^{2} at 1 to 10 volts according to size of article. Pt film is much thinner than a Ag film, 1/25 of Ag thickness will give equal life. The time for plating is very short so that the costs of the process are made up mostly by metal deposited. Ha (7a)

Platinum Plating. G. W. LAMOTTE. *Electrical Review,* Vol. 3, Sept. 16, 1932, page 387. Electrodeposition of Pt directly on base metals has recently been perfected and has been made commercially feasible for articles of general use. The coating has remarkable resistance to wear and corrosion and has a brilliant luster. Electrolyte contains about 3 oz. troy of plating salt to each gallon of solution. Thickness of deposit varies from 0.00002-0.00004 inch, depending upon usage to which articles will be put. A current density of 7.5 amp./ft.^{2} is recommended, and under these conditions a deposit 0.00003 inch thick is obtained in 6 min. MS (7a)

Notes on the Efficiency of Rhodium Plating Baths. V. L. BIGSBY. *Metal Industry,* New York, Vol. 31, Apr. 1933, pages 132-133. High plating efficiency is desirable for purpose of increasing density of rhodium plate and minimizing porosity. Color plus a high efficiency plate gives a finish that is many times more durable and corrosion resistant than a plate that has the desired characteristic alone. PRK (7a)

Glacial Acetic Acid as a Solvent for the Electrodeposition of Metals. An X-Ray Diffraction Study of the Structure of Deposits of Arsenic, Antimony and Bismuth. C. W. STILLWELL & L. F. AUDRIETH. *Journal American Chemical Society,* Vol. 54, Feb. 1932, pages 472-478. As, Sb and Bi may be electrodeposited from solutions of their chlorides in glacial acetic acid. X-ray diffraction patterns of these deposits indicate that under the conditions of temperature and concentration studied, As is always obtained in the amorphous form, whereas Bi is discharged as the crystalline metal. Sb may be deposited in either the "explosive" metastable modification or in the crystalline form depending upon temperature and concentration. MEH (7a)

Electrometallurgy (7b)

The Acton Precious Metals Refinery. *Journal Society of Chemical Industry,* Vol. 51, Oct. 14, 1932, pages 858-860. Description of separation of 7 metals: Pt, Au, Pd, Ag, Ru, Ir and Rh as conducted at the Acton refinery of the International Nickel Co. of Canada. VVK (7b)

Preparation of Metal Powders by Electrolysis of Fused Salts. III—Tantalum. F. H. Driggs & W. C. Lilliendahl. *Industrial & Engineering Chemistry,* Vol. 23, June 1931, pages 634-637. Electrolysis of fused salts has been successfully applied to production of Ta metal of a high degree of purity. Method consists of electrolyzing Ta oxide dissolved in K fluotantalate in the presence of other alkali halides. The effect of fluorides and chlorides upon the character of the deposited metal is shown to be an increase in the particle size and also in current efficiency. Pressing, sintering, and degasifying the metal by heat treatment in vacuo are necessary to obtain ductile metal. Some results are illustrated in the use of this method for obtaining Ta plate on base metals. MEH (7b)

Refining of Nickel. C. C. Downie. *Electrical Review,* Vol. 111, Aug. 26, 1932, page 282. Chief difficulty in electrolytic refining of Ni is that both Cu and Fe, which are invariably present in the unrefined metal, are deposited first. In addition, a thick coherent layer of Ni is difficult to produce. Use of superposed a. c. offers the likeliest system of overcoming these difficulties. Superposed a. c. largely eliminates passivity and other retardation phenomena, and permits of working at much greater current density. Most satisfactory deposits are obtained by using moderately high temperature, high Ni concentration, not too high current density, and means of controlling pH within narrow limits. In a large-scale experimental plant, anodes are placed in special canvas bags to retain the slimes, which contain the precious metals. Cathodes are made of Fe plates protected by graphite. Electrolyte is maintained at 4% Ni and kept slightly acid with H_2SO_4. Prior to the introduction of superposed a.c., a pressure of 3-4 volts per tank was used, and current density of 8-10 amp./ft.^{2}. MS (7b)

Production and Technical Importance of Beryllium. (Herstellung und technische Bedeutung des Berylliums.) *Maschinenkonstrukteur- Betriebstechnik,* Vol. 65, Aug. 10, 1932, page 100. The largest amount of Be produced in Europe is made from an Al-Be silicate with 5% Be found at Koeflach, Austria. The European method of electrolysis differs from the American in that higher temperatures (1300°-1500° C.) are used in the air-tight furnaces according to the Seidler patents. The improvement of the properties of Cu, Al and Ni by the addition of Be is discussed. A survey is given on the present use of Be alloys. GN (7b)

Contribution to the Electro-Metallurgy of Aluminum. (Beitrag zur Elektrometallurgie des Aluminiums.) P. P. Fedotieff. *Zeitschrift für anorganische und allgemeine Chemie,* Vol. 206, June 18, 1932, pages 267-269. The mechanism of the electrolysis of melts of cryolite-alumina is discussed. Free Al_2F_6 is formed at the anode, and Na_3AlO_3 at the cathode. It is advisable to work with cryolite which contains an excess of aluminum fluoride. Ha (7b)

Electrolytic Zinc. Charles W. Cuno. *Chemical Markets,* Vol. 28, Mar. 1931, pages 253-256. The advantages of the electrolytic over the smelter process are described. They consist mainly in a higher grade of metal, a greater extraction of Zn, the possibility of treating low grade materials which cannot be treated by smelting, and in the recovery of important elements in the ore which otherwise are lost in the smelting process. The plant described obtains as by-products S, Cd, Cu, Pb, Ag, Au, Mn; and Ge, Tl, In and Ga can be added if a sufficient market would warrant their commercial recovery. Ha (7b)

The Electrolytic Precipitation of Copper in Nitric Solution and a Simplified Method for the Electrolytic Separation of Copper and Lead. (Ueber die elektrolytische Ausfällung des Kupfers in salpetersaurer Lösung und über ein vereinfachtes Verfahren zur elektrolytischen Trennung von Kupfer und Blei.) H. Bjorn-Anderson. *Zeitschrift für analytische Chemie,* Vol. 89, No. 5/6, 1932, pages 178-187. The result of the investigation is in short that the electrolytic deposition of Cu in HNO_3 solutions is delayed and complete deposition is prevented by formation of nitride; a quantitative deposition can take place if the nitride is destroyed or the acid neutralized. The velocity of precipitation increases with the current density, the deposit adheres firmly even at high current density. Results are described in detail. Ha (7b)

Electrolytic Deposition of Nickel with Insoluble Anodes. V. I. Layner, S. A. Pletenev, V. A. Kuznetzov & B. I. Rosov. *Tzvetnuie Metallui,* Oct. 1931, pages 1294-1310. Experiments were made with the object of working out a method for electrolytic deposition of Ni from Khalila (Russia) ores containing considerable amounts of iron. Ni was deposited from $NiSO_4$ solutions using Al cathodes and Pt anodes. (1) It was found that the optimum conditions for the electrolytic treatment of the ores were: temperature 80°; concentration of Ni 20 g./l.; current density 600 amps./m.^{2} (2) the process of electrolysis recommended on the basis of the experiments is as follows: (a) acid proof clay diaphragms should be used between the anode and cathode portions of the bath. (b) The circulation of the anodic and cathodic solutions is carried on separately. (c) The cathodic solution circulates in cascades. (d) As a circulating anodic solution in each bath, Na_2SO_4 solutions of different concentrations are used. The discharged cathode solution contains 1 to 1.5 g. Ni and 0.8 to 1.3 g. H_2SO_4/l. The anodic solution contains 6 to 18 g. free H_2SO_4 and 25 to 70 g. Na_2SO_4/l. (3) In the continuous process the anodic solution after the intermediate operation of crystallizing out the Na_2SO_4 may be used for leeching the ores. (4) With rotating cathodes the deposition of Ni is possible when the Fe:Ni ratio does not exceed 1:10. The presence of small amounts of Al (below 0.1 g./l.) is desirable. BND (7b)

The Electrolytic Behaviour of Gold II. Y. Kimata. *Journal Mining Institute of Japan,* Vol. 47, 1931, pages 1190-1240. Principles of the Wohlwill Au refining process, practiced at the Hitachi Mine were studied in detail. Pure Au was used as the anode and the standard composition of the electrolyte was Au 5% and HCl 5%. Both anode and cathode current efficiencies, calculated on the assumption that all the Au was trivalent, were measured under various conditions. The anodic current efficiency, A, can be expressed by an empirical formula, $A = 15000/(mD^n + 50)$, where m and n are functions of temperature. And N_A, the fraction of the Au dissolved as $AuCl_4$, is expressed by $N_A = mD^n$. Similar expressions hold also in the case of the cathode. The composition of the solution lying in a dynamic equilibrium after continued electrolysis was found to be independent of the current density and 95.4% of the total Au existed in trivalent state. This value is a little less than that of the true equilibrium (97.5%). Preliminary experiments to find the time elapsed before the setting in of the precipitation of Au slimes were carried out. The effects of the superposed a. c. were studied by using an oscillograph. Instead of assuming the direct oxidation of Au into Au^{+++}, the author took the following view. Au is first oxidized electrochemically into Au^{+}, a part of which changes chemically into $AuCl_2'$, while the remainder is oxidized further into $AuCl_4'$. All phenomena can be explained according to this view and assuming a relation between the velocity of the formation of the complex ion $AuCl_2'$ and the electrochemical oxidation. Single potentials at both electrodes were measured at different temperatures, current density and composition of the electrolyte. Although Wohlwill believed that the dissolution of Au entirely stops as soon as the gas evolution commences, the author confirmed that Au does dissolve to some extent with the evolution of gases. In the case of pulsating current, not only Cl but also O was stated to be evolved. When a.c. is superposed, the rate of dissolution of Au at current densities above the value limited by the gas evolution increases. Although fluctuations of potential were observed at high current densities, it did not occur when the superposed a.c. exceeded 150%. Explanations are given of the above phenomena by assuming the reactions in the evolution of O and Cl. The Au slime is explained as being produced by the decomposition of $AuCl_2'$ and its amount was found to decrease with increasing current density. YO (7b)

METALLIC COATINGS OTHER THAN ELECTROPLATING (8)

Preparation of Thin, Free Metallic Foils. (Zur Herstellung dünner, freier Metallhäutchen.) C. Müller. *Physikalische Zeitschrift.* Vol. 34, Apr. 15, 1933, pages 340-341. Reviews work done. There remains question as to what kind of electrode will make possible deposition of a film with a lattice-like structure instead of homogeneous atom distribution. Investigation of this subject is being planned at Physikalisch-Technischen Reichsanstalt. RRS (8)

Surface-hardening Copper. W. J. May. *Mechanical World & Engineering Record,* Vol. 91, Mar. 11, 1932, page 254. Cu is heated to 750° C. and Sn is rubbed into the surface until a regular degree of alloying is secured. The depth of penetration depends on the time Cu is kept heated to redness. Except for small loss from oxidation the Sn remains unchanged at the heat used, and the Cu remains unchanged where the Sn does not reach. Kz (8)

Tinning of Cast Iron and Malleable Iron. (Das Verzinnen von Gusseisen und Temperguss.) A. Jaeschke. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 30, 1933, page 175. Detailed discussion of procedure followed. Success essentially depends on composition. Copper coating before tinning is advantageous. GN (8)

Stainless Steel Linings for Vessels used in Chemical Processes. W. E. Jominy & R. S. Archer. *Paper Trade Journal,* Vol. 96, Apr. 20, 1933, pages 28-35. Success of lining plain C steel with stainless steel depends upon welding. Welding by rolling is a recent development and lighter gages made up of a thickness of ¼ stainless steel and ¾ C steel can be obtained. Stainless steels can be arc welded when special coated welding rods are used. Many welds produced in the past have failed in corrosion tests because of the precipitation of Cr carbides at the grain boundaries caused by the heating during welding. Minimizing the C content and addition of other elements such as Ti have decreased the tendency to corrode at the weld. Other precautions during welding also minimized grain boundary carbide precipitation. Relatively thin stainless sheet is spot welded to a thicker C steel plate when welded methods were perfected. Tensile tests, tests regarding linear coefficient of expansion were made, and corrosion resistance to H_2S were made with favorable results in each case. Commercial vessels were made for the oil industry, one of which has been in service over 2 years with entire satisfaction. Experiments were carried out with sulphite liquors. Accelerated corrosion tests were devised but failed to give true results since H_2SO_4 was generated when the time was increased. Spot welded specimens were then made up and hung in commercial digesters. These were made of 5 different types of stainless steels, and were distributed to 4 different paper mills. After 9-11 months the samples were removed, photographed, cleaned, examined and rated. Results are tabulated. 3 small lined digesters have been built for large scale laboratory investigations. After a year's use these are giving good service. Comparison of metal and ceramic linings is given. CBJ (8)

Essential Characteristics of Sprayed Metal Coatings. (Die wesentlichen Merkmale gespritzter Metallüberzüge.) H. Reininger. *Zeitschrift für Metallkunde,* Vol. 25, Mar. 1933, pages 42-44, 71-73. Brief review of production and usefulness of sprayed metal coatings. Characteristics of various sprayed coatings are briefly described and their structure illustrated by low-magnification photographs. RFM (8)

Metallic Cementation and its Recent Progress. (La Cementation Métallique et ses Récents Progrès.) Joseph Laissus. *Bulletin de l'Association Technique de Fonderie,* Vol. 16, Aug. 1932, pages 365-375. Paper at World Foundry Congress, Paris, Sept. 1932. Formation of alloys or solid solutions on surfaces of steel, gray iron and non-ferrous metals at low, medium and high temperatures is discussed. Zr, Ti, U, V, Cr, B, Co, Ta and W were used as cementation metals with steel at high temperatures, 1000° to 1200° C.

Results:	Best Cementation Metal:
Surface hardness	U, Zr
Resistance to oxidation at high temperatures	Zr
Corrosion resistance	
(a) H_2O	Ta, Cr
(b) HCl	Mo
(c) dilute H_2SO_4	W
(d) HNO_3	Cr

The cementation gave surfaces capable of taking a very high polish. Suitable metals and proper temperatures gave these properties to gray iron and non-ferrous alloys also. 14 references. See also *Metals & Alloys,* Vol. 3, Nov. 1932, page MA 324. WHS (8)

Note on Cathode Sputtering. F. H. Newman. *London, Edinburgh & Dublin Philosophical Magazine & Journal of Science,* Vol. 14, Dec. 1932, pages 1047-1049. Rate of cathodic deposition of a metal is increased by sputtering in a heavy gas, being about 5 times faster in argon than in hydrogen. Describes apparatus used and sputtering technique. RHP (8)

An Improved Method for Producing Metallic Coatings. (Ein verbessertes Verfahren zur Erzeugung metallischer Ueberzüge.) J. F. Kesper. *Oberflächentechnik,* Vol. 10, May 2, 1933, page 108. An improvement in the sherardizing process was brought about by using instead of the Zn dust formerly used alone a mixture of 80% quartz sand and 20% Zn dust a small amount of naphthaline to prevent formation of Zn carbonate. This method eliminates the Zn lumps which often formed and made a rough surface on the treated material. The pieces to be treated must be carefully cleaned. Cu pieces must be pickled before treatment in a solution of 100 parts concentrated H_2SO_4 and 75 parts HNO_3; the Cu pieces must be dry for the immersion. If they show a grainy (mottled) surface they are left 24 hrs. in a solution of 1 part H_2SO_4, 1 part HNO_3 and 8 parts H_2O before the other pickling solution is applied. Objects treated in this manner show a very fine appearance which is very durable. Ha (8)

Mist Plating. *Product Engineering,* Vol. 4, Jan. 1933, page 24. New method of plating without electrodes is briefly described. Process takes place in a vacuum chamber where a piece of metal with which object is to be covered is suspended inside a W-wire coil and heated by it. At high temperatures metal dissolves into a fine mist which covers everything in vacuum chamber with great uniformity; method is applicable to metals as well as to non-metallic materials. Plating with Pt, Au, Ag, Sn, Al, Ir and Cu has been accomplished, a film of gold of 0.00001" could be deposited which was absolutely uniform. Ha (8)

The Galvanizing of Screw Spikes for Railway Chairs. *Railway Engineer,* Vol. 53, Mar. 1932, pages 117-118. While (1) spray galvanizing, (2) electrolytic galvanizing, and (3) sherardizing are only briefly characterized, the most common method of hot galvanizing is fully dealt with. Among the specified tests for coating the (1) Preece copper sulphate and (2) the weight tests are considered. WH (8)

Rolled Nickel in Composite Metal Products. *Welder,* Vol. 4, Feb. 1933, pages 3-8. A composite product consisting of Ni rolled on steel is described which by proper treatment in rolling provides a true bond between the Ni and Fe surfaces in contact. The most generally used Ni clad plate is ¼" thick with a Ni covering of 10%. The material is used in equipment for manufacture of caustic soda, in dye stuff industries, cellulose acetate manufacture, in peroxide bleaching kettles, sizing drums, etc., in textile industries, soap manufacture, varnish industry and manufacture of food stuffs. It can readily be welded. Ha (8)

This is the age of metals and alloys.

Whether it is a tiny piece of some relatively rare metal for a radio tube or a huge alloy forging for an oil still. These abstracts will tell you what is going on.

Chemically Resistant Steels and Their Use in Organic Synthesis. (Les aciers chimiquement résistant et la materiel des usines de synthèse organique.) A. MATAGRIN. *La Revue de Chimie Industrielle,* Vol. 41, Nov. 1932, pages 311-317; Dec. 1932, pages 341-349. Different materials resisting corrosion of various products of organic chemistry secured by synthetic processes are discussed. Use of pure Ag, Ni, Pb, Cu, Al and Armco Fe are dealt with in second chapter. Balance of paper takes up evolution and technical characteristics of corrosion resistant steels separately, treating steels on Ni, Cr and Cr-Ni base with and without additions of Si, Mn, Mo and W, and Cu bearing steels. Advantages and properties of Ni-Cr steels are particularly stressed. Various corrosion resistant steels on market including American brands are listed with emphasis on their suitability for synthetic chemical processes. WH (9)

Modern Steel Mine Car. J. S. MILLER. *Mining Congress Journal,* Vol. 19, June 1933, page 24. Originally presented at the 10th Annual Convention of American Mining Congress, Pittsburgh, Pa., May 1933. The latest type of mine car has reduced the maintenance cost of car repairs 50% and has eliminated many delays incidental to transportation. Other improvements in mine-car construction are: loose wheels with an inside roller bearing; pressure grease gun for lubrication of roller bearings; mechanical equalized brakes; spring supports on anxle mountings; manganese steel wheels. It is also an advantage to paint the steel cars once a year. DTR (9)

Cylinder Cast Iron. (Das Zylindergusseisen.) L. SCHMID. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 30, 1933, pages 171-173. Discusses structure, physical, mechanical properties, chemical composition and raw materials used in melting such cast Fe. C: 3.30-3%, Si: 1.80-0.70% depending on wall thickness, Mn: 0.70-1.20%, P max 0.75%, not more than 0.50% for parts subjected to dynamic loads, or even as low as 0.25% to meet dynamic loads and thermal stresses, S as low as possible .08-.05%. Special alloys are used for motorcycles and automobile cylinders. GN (9)

Acetylene Welding as Constructive Element in Modern Refrigeration Technique (Azetylenschweissung als Konstruktions Element in der modernen Kaltetechnik). HEINR. SCHNEIDER. *Autogene Metallbearbeitung,* Vol. 26, Feb. 1, 1933, pages 33-43. Numerous examples illustrate the construction of refrigeration apparatus by using welded tanks, piping, heat-exchanging devices, preheaters, etc. Gas-fusion welding is generally cheaper than electric welding but the latter gives more reliable and dense welds. Density is especially important in SO_2, CH_3Cl and ammonia apparatus. Iron, steel and Al can equally well be used; cast iron is now less used as built-up constructions are cheaper. Ha (9)

Thermostatic Metal—or Bimetal Nature and Utility. H. SCOTT. *Metal Progress,* Vol. 22, Nov. 1932, pages 29-33. History and description of various forms and uses of bimetal is given together with formulae for calculating deflection and stress of joints. Merits and defects of various alloys that have been used are stated. The need for a combination of equally hard alloys with great activity is pointed out. WLC (9)

A Comparison of Inlay Casting Rings Made of Different Metals. K. W. RAY. *Dental Cosmos,* Vol. 75, Feb. 1933, pages 153-155. Rings of Fe, Cu, brass, Ni, Monel, and austenitic stainless steel are compared as to hardness, corrosion and scaling resistance, thermal expansion, weight, and cost. Fe, Cu, and brass are cheaper but are unsatisfactory, due to scaling and ease of deformation after heating. The other materials were more satisfactory but cost 2 to 3 times as much. Ni ranked first in resistance to corrosion and scaling but was easily deformed by misuse. Monel and austenitic stainless steel were corroded somewhat under severe conditions but were otherwise superior. OEH (9)

New Type of Reinforcing Bar Develops High Bond Stress. CHESLEY J. POSEY. *Engineering News-Record,* Vol. 110, Apr. 13, 1933, page 461. Experimental work shows that reinforcing bar with closely spaced notches or crenulations develops higher bond stress than the usual deformed bar. CBJ (9)

Use of Aluminum for Switches. (Aluminium im Bau von Schaltanlagen.) M. PREISWERK. *Schweizerische Technische Zeitschrift,* Vol. 30, Apr. 20, 1933, pages 220-225. Use of Al as conductor in electrical switching equipment is considered. Examples are described and shown, proving suitability of Al for this purpose. It is pointed out that Al is at least equivalent to Cu, in certain instances even superior. GN (9)

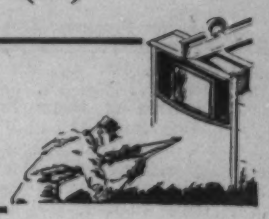
Alloy Steels and Their Uses in the Mining Industry. W. J. PRIESTLEY. *Mining Congress Journal,* Vol. 19, Mar. 1933, pages 23-24, 34, 36-37. Use of alloy steels will be an important issue in reconstruction of obsolete plants and processes which have generally gone into discard during past few years of greatly curtailed production. Resourceful engineer will make good use of these new metals and materials, which were not available when original plants were built. Writer discusses general properties and applications of principal Mn, Cr, Ni, and other alloy steels. In particular a list is given of a number of mining equipment parts which have already given good service, together with kinds of alloy steels used in their production. Mn and Cr are added to steel to furnish resistance to wear, while Cr, V, Ni and Mo give increased strength. High percentages of Cr are added to combat serious problems in corrosion and oxidation. DTR (9)

The Achievements of Aluminum. E. T. PAYNTON. *Railway Engineer,* Vol. 53, July 1932, page 248. Regarding weight reduction, substantial possibilities of improvement resulting from a change in material itself are pointed out. Data presented refer to results gained on Al in this country, France and Germany. WH (9)

Aluminum and Its Alloys in Transportation Field. (Aluminium und seine Legierungen im Transportwesen.) J. KRAPF. *Schweizerische Technische Zeitschrift,* Vol. 30, Apr. 20, 1933, pages 214-220. Discusses ever increasing replacement of wood and steel in transportation field by light metal alloys, as in airplane, automobile, railway, aerial tramway, etc. construction. GN (9)

Progress Report on Research on Dental Materials. GEORGE C. PAFFENBARGER & WM. T. SWEENEY. *Journal American Dental Association,* Vol. 20, May 1933, pages 885-889. The work done during the 4 years of coöperative research by the American Dental Association at the Bureau of Standards is reviewed. The materials studied have included: amalgam alloys, inlay casting investments, impression compounds, inlay waxes, inlay casting gold, mercury for dental use, and wrought gold wire alloys. Tentative specifications have been adopted. Dental cements are being studied, and some of the standards are being revised. OEH (9)

Is Your Heat Treating Plant Up-to-date?



This section digests the world's heat treating practices.

Hardening (10a)

Magnetic Superhardening and Stabilization of Metals. EDWARD G. HERBERT. *American Machinist,* Vol. 76, Mar. 24, 1932, pages 385-388. A spontaneous hardening of steel was noted after testing by the "Cloudburst." This was thought to be due to atomic rearrangement within the metal. To hasten this rearrangement a magnetic treatment was applied. This is alleged to have led to a cycle of changes, comprising periods of alternate softening and hardening during many hours. Experimentation on a razor blade placed across the poles of an electro-magnet and rotated 1¼ turns. Hardness was measured with a Herbert Pendulum hardness tester. Hardness increased from 61.4 to 64.7 diamond-time hardness. ½ hour later the hardness had fallen to less than the original value. 6 alternating changes were noted during 2 days. A theory of a stabilizing treatment to reduce the fluctuations is advanced. Experimental work is claimed to show that such treatment will give a fairly steady increasing hardness. The original rotary treatment is usually given at 150° to 250° C. The stabilizing process consists in placing the specimen across the spark gap, usually for about a minute or more, but stabilization can only be effective if applied at a definite period after the rotary treatment, being timed to coincide with a selected phase of hardness fluctuations, as determined by serial testing in a previous experiment. Illustrates and briefly describes an electromagnet suitable for these treatments. RHP (10a)

Case Hardening & Nitrogen Hardening (10c)

Effect of Ni on the Nitriding of Steel. (Einfluss von Nickel auf das Nitrieren des Stahles.) *Die Metallbörse,* Vol. 23, Nov. 26, 1932, pages 1518-1519. The contradictory results on the action of Ni upon nitriding steels are reviewed with emphasis on the contributions of French & Homerberg. The beneficial effect of Ni in the core is stressed. The maximum hardening effect of the case is counteracted by Ni. The most favorable Ni content is 2-3.5% which reduces the surface hardness by 5-12% but raises the Brinell hardness and tenacity of the core by 50-130%. The effect of Ni is also dependent on the accompanying alloy elements. Ni additions are recommended in the following steels: (1) 1.1% Cr, 0.95% Al, 0.25% Mo, 0.5% Ni; (2) 1.1% Cr, 0.4% Al, 0.5% V, 2.5% Ni; (3) 0.5% Cr, 0.5% Al, 0.5% Mo, 0.5% V, 2.5% Ni. EF (10c)

Nitride Hardening. *Machinery,* London, Vol. 40, May 5, 1932, pages 137-139. Former publications of O. E. Harder & M. A. Grossmann are discussed in detail. See *Metals & Alloys,* Vol. 2, Sept. 1931, pages 132-142, 150-154. Kz (10c)

Quenching (10d)

A Contribution to the Study of Quenched Steel Structures. (Contribution à l'étude des structures de trempe de l'acier.) ROBERT SCHMIDT. *Revue de Métallurgie,* Vol. 30, Jan. 1933, pages 30-40; Feb. 1933, pages 54-62. Steel having uniformly troostitic structure could be prepared by quenching specimens from a few degrees above the critical point in mixtures of water and glycerine containing less than 50% of the former, but even here the transformation is not complete. Troostite forms by precipitation of ultramicroscopic carbon around nuclei which heating did not bring into solution. Its formation is marked by the break in dilatometer curves at a comparatively high temperature. Troostite is always accompanied either by pearlite when cooling is mild or martensite when it is intense. The physical properties of troostite are very close to those of pearlite. It is always sharply divided from martensite but is liable to merge with pearlite. Martensite is strongly and troostite is barely colored by 0.25% picric acid in alcohol. Sorbite is formed by drawing of martensite and forms uniformly all over the specimen. Up to 400° C. sorbite still has the properties of martensite though somewhat reduced which completely disappear above this temperature. Under this temperature both martensite and sorbite produced from it are colored by 0.25% picric acid, which distinguishes them from troostite. The latter forms by mild quenching after insufficient heating and is an aggregate of iron carbide and iron. Chemically troostite is analogous to pearlite. On heating it does not decompose until 400° C. when carbides begin to coagulate into lamellae which characterize pearlite. Sorbite forming upon the decomposition of martensite is an emulsion of iron carbide precipitated within martensite. Its properties are really a function of the martensitic matrix and depend therefore on the temperature. JDG (10d)

The Chemist and Quenching Media for Steels. E. E. HALLS. *Industrial Chemist,* Vol. 8, Oct. 1932, pages 340-342. A general discussion of quenching requirements followed by a classification and discussion of the properties to be exhibited by an ideal quenching medium. These he lists as stability, viscosity, and thermal characteristics. Time-temperature and viscosity-temperature curves are given. RAW (10d)

Drawing (10e)

On the Temper-Brittleness of Steels. KIYOSHI NAGASAWA. *Tetsu-to-Hagane,* Vol. 19, Mar. 1933, pages 174-196. (In Japanese). **More Light on Temper Brittleness.** KOTARO HONDA. *Metal Progress,* Vol. 23, June 1933, pages 43-44. Honda summarizes work of Nagasawa. The elements Cr, Mn, Si, Ni and P promote temper brittleness because they are increasingly soluble in ferrite with temperature. The elements, S, Mo and W, do not because their solubility is constant. Structural diagrams show this difference. One kind of temper brittleness, named by the author, "first temper brittleness," is evident on reheating between 450° to 520° C. and is unaffected by final cooling rate. The other named "second temper brittleness," occurs above 520° and is affected by final cooling rate. The free carbide increases to 520° and the rate of cooling of specimens treated at or below this temperature does not affect the amount of carbide precipitated. Above 520° the amount of carbide decreases with temperature, and in a specimen slowly cooled from this range the carbide would be set free on passing the point 520°, giving the same effect as merely reheating to 520°. On quenching from tempering temperatures above 520° the absorbed carbide remains as such. Impact value of specimens slowly cooled from above 520° are smaller than those quenched from above 520° as shown by impact curves of alloy steels. WLC (10e)

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Aging (10f)

Age-hardening in Some Alloy Steels Quenched Below A_1 Point. RYONOSUKÉ YAMADA, KINJI YOKOYAMA, SYOJI OKADA & TAKESI TASIRO. *Journal Society of Mechanical Engineers,* Tokyo, Vol. 35, Aug. 1932, pages 766-771. The phenomenon of age-hardening was studied with some Ni-steels, Si-steels, and Ni-Cr-steels, containing up to 3% Ni, 4.6% Si and 0.4% Cr, with about 0.1% C. All steels were quenched below the A_1 point. Hardness increases with lapse of time at ordinary temperatures, and slightly increases by heating samples aged one month, then rapidly decreases by tempering at temperatures up to 200° C. Above this temperature the change in hardness is not so significant. Both specific volume and electrical resistance increase by quenching below the A_1 point; the former decreases while the latter increases during aging. Notch toughness drops. The age-hardening is closely connected with the change of the solubility of carbon in α-solid solution either of Fe and Ni or Fe and Si below the A_1 point. By quenching below the A_1 point, a supersaturated α-solid solution with respect to C is secured and during aging at ordinary temperatures C atoms move towards certain points within the lattice of the α-solid solution and thus accumulate. Assemblage of C atoms causes distortion of the lattice resulting in hardening effect in steels. By tempering above 50° C. cementite molecules abandon the solid solution and above 250° C. the formation of space lattice of Fe_3C takes place, which is connected with a drop in hardness. Kz (10f)

Secondary Hardening of Quenched Vanadium Steels by Drawing. (Durcissement secondaire par revenu des aciers au vanadium trempes.) M. SAUVEGOT. *Chimie et Industrie,* Vol. 27, Special Number, Mar. 1932, pages 334-344. Low C steels (less than 0.20% C) containing 0.33 to 0.99% V show secondary hardening at about 600°-650° C. after they have been quenched at a sufficiently high temperature (about 1000° C.). This hardening, accompanied by an increased elastic limit, and resistance, and a reduction in resilience is also accompanied by a dilatation and reduction in electrical resistance. It appears to be due to the precipitation of V_4C_3 at a high temperature, which remains in solution after quenching. The same phenomenon exists in higher C steels but is partially veiled by the effects of quenching and the drawing because of the C. These results contribute to the explanation of the favorable action of V on secondary hardening and on the properties of high speed steels. Tests were made on 3 steels with the C and V content as above given. MAB (10f)

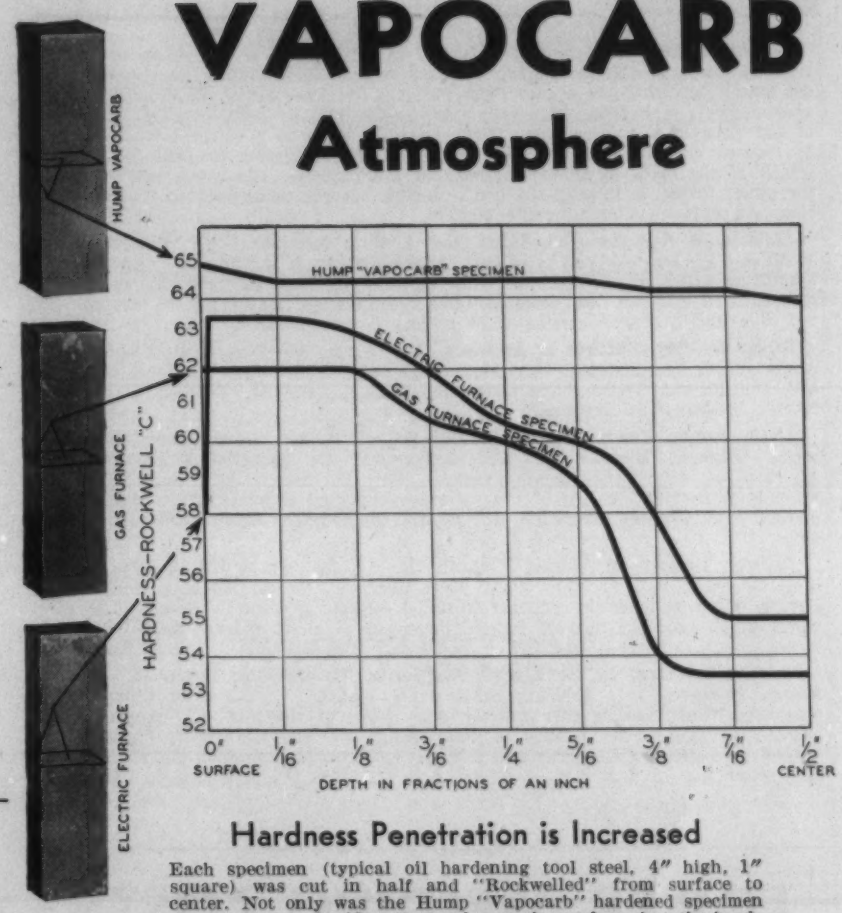
Aging of Aluminum-Beryllium Alloys After Tempering (Sur le vieillissement après trempe des alliages aluminium-glucinium). C. MATIGNON & J. CALVET. *Comptes Rendus,* Vol. 196, May 1, 1933, pages 1256-1260. Results for alloys made from very pure metals are compared with those made from commercial metals. Aging is followed in terms of the Brinell hardness, the various alloys being tempered in cold water after annealing at 628° C. Other mechanical properties are compared after the same treatment. The aging at ordinary temperatures is 50% complete after about 10 minutes; after aging the hardness and the elastic limit are considerably increased. OWE (10f)

Malleableizing (10g)

Transformation in the Carbide Phase During Graphitization. H. A. SCHWARTZ, KENT R. VAN HORN & C. H. JUNGE. *Transactions American Society for Steel Treating,* Vol. 21, May 1933, pages 463-480. Paper presented at Buffalo Convention, Oct. 1932. Experiments on a white cast iron to determine the changes during graphite formation are described. At temperatures near A_1, cementite in graphitizable alloys is not a definite chemical compound but varies in C content with temperature. A sudden increase in C followed by a continuous decrease of C with temperature is noted. X-ray diffraction results are tabulated to show that all cementites, including Fe_3C have similar space lattices but not identical parameter. Mechanism of incipient graphitization is outlined. Authors suggest that cementite and Fe_3C are chemically different compounds, cementite being of indefinite composition. Includes discussion. 14 references. WLC (10g)

6

By HUMP Hardening IN A VAPOCARB Atmosphere



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I-319

JOINING OF METALS & ALLOYS (11)
Welding & Cutting (11c)

Have You a Joining Problem?

From January to July 1933 this section digested 399 articles on welding, cutting, soldering, brazing and riveting.

Graphic Method to Determine Influence of the Length of the Arms of a Spot-Welding Machine. (Méthode graphique pour determiner l'influence de l'augmentation des bras d' une machine a sonder par points.) M. Mathieu. *L'Industrie Électrique,* Vol. 41, Nov. 10, 1932, pages 486-489. Increase of the length of the arms of a spot-welding machine usually leads to a reduced production due to reduced electrical output. The amount of this reduction as dependent on the length of the leads of the transformer to the machine, the consequent change of the power factor is investigated and a graphic method developed for its determination. An example illustrates the method. Ha (11c)

Welding of Rail Ends on Steam and Electric Railroads. A. W. McClary. *Welding Engineer,* Vol. 18, Feb. 18, 1933, pages 18-20. The economic advantages which might be obtained by building up more rail ends by welding are discussed. 3 methods are described and the different stages are illustrated. The use of a high-frequency current (120 cycles) is recommended. Ha (11c)

Bridge Welding Practices in Australia. W. T. B. McCormack. *Engineering News-Record,* Vol. 110, May 11, 1933, pages 596-598. Covered electrodes and multiple-run beads characterize the welding procedure. Welding practices in specific instances are discussed. CBJ (11c)

Little Known Cause for the Burning-out of Oxygen Reduction-Valves. (Eine wenig bekannte Ursache für das Ausbrennen von Sauerstoff-Reduzierventilen.) M. Meier. *Die Schmelzschweissung,* Vol. 11, Dec. 1932, page 269. Possible reasons for heating of the valve are discussed and precautions described to prevent especially the formation of explosive oxy-hydrogen and back-firing. 4 references. Ha (11c)

Railway Sleepers—A Welded Product. E. C. Moore & T. A. Swindell. *The Welder,* Vol. 4, Mar. 1933, pages 6-9. Description of a steel railway sleeper which is made by pressing a rolled section to form a trough. The steel chairs which hold the rail are located by means of a jig and are welded in place. TEJ (11c)

Welding Cast Iron by the Electric Arc versus Oxy-acetylene Torch. H. Bloomfield. *Welder,* Vol. 4, Mar. 1933, pages 19-20. The chief things to be considered in arc welding cast iron are: (1) choice of electrode, (2) proper adjustment of amperage, (3) method of commencing the job. The author describes the method used in successfully welding a large cast iron pinion which had been broken in 8 places. TEJ (11c)

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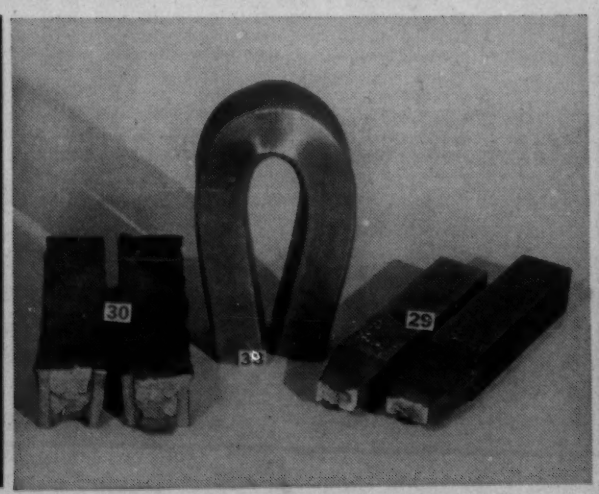

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Conditioning, Shaping and Machining of Carbon Steel by Oxygen. H. H. Moss. *Journal American Welding Society,* Vol. 12, Jan. 1933, pages 18-24. Paper presented at Fall Meeting, American Welding Society in Buffalo, Oct. 1932. A survey of the field of flame cutting and flame machining with some interesting illustrations of the type of work which has been done. Data is given in regard to oxygen consumption, costs, amount of metal removed per hour, cutting tolerances and probable further development of the process. TEJ (11c)

Welding Standardization and Promotion in the Piping Industry. S. Lewis Land. *Journal American Welding Society,* Vol. 12, Jan. 1933, pages 13-14. Paper presented at Joint Meeting, New York Section American Welding Society and the Petroleum and Power Division, A. S. M. E., Dec. 13, 1932. Outlines welding activities of Heating and Piping Contractors National Association. TEJ (11c)

Progress in Building Welding Machines. (Neuer Fortschritt im Schweissmaschinenbau.) H. Langkau. *Die Elektroschweissung,* Vol. 4, Mar. 1933, pages 48-50. Results obtained with new type welding machine are reported. Oscillographs of service conditions of machine are shown. GN (11c)

Machining with Oxyacetylene. H. H. Moss. *American Machinist,* Vol. 76, Dec. 21, 1932, pages 1217-1219; Vol. 77, Jan. 4, 1933, pages 14-16. By applying the flame in a tangential position to the piece other machining operations may be performed beyond those of simple cutting. Several examples of "flame-machining" as applied to large machinery, planing, screw-thread cutting and others are illustrated. Ha (11c)

Avoidance of Shrinkage Stresses in Electric Welding. (Vermeiden von Schrumpfspannungen beim elektrischen Schweissen.) Kurt Müller. *Archiv für Wärmewirtschaft und Dampfkesselwesen,* Vol. 14, Feb. 1933, pages 41-42. The practical experiences in electrically welding the anchors of a Steinmüller boiler are discussed. The original anchor was composed of 3 welded ribs that cracked repeatedly. Another welding arrangement was then used in that precautions were taken that the rib just being welded cooled slowly. This method proved successful. The shrinkage stresses were thus reduced to a minimum. GN (11c)

Developments in Pressure Vessel Welding in 1932. C. W. Obert. *Journal American Welding Society,* Vol. 12, Apr. 1933, page 25; *Welding Journal,* Vol. 30, May 1933, pages 145, 148. The field of pressure vessel welding has set its house in order and is indisputably prepared for the reconstruction period that will inevitably follow the depression. Some details of the A. S. M. E. welding rules are discussed. TEJ (11c)

An Arc-Welded Highway Bridge Design. Ira T. Kelly. *Journal American Welding Society,* Vol. 12, May 1933, pages 18-21. Presents important details of an arc-welded through truss steel highway bridge designed for a span of 140 ft. and roadway width of 24 ft. Cost estimate shows about 15% savings over riveted construction. TEJ (11c)

Welding, Keystone of Ford Body Building. E. F. Ross. *Steel,* Vol. 90, June 20, 1932, pages 23-25. Second Article. A description of various welding methods and types of automatic welding equipment used by the Ford Motor Co. in the fabrication of their all-steel automobile bodies. JN (11c)

Ford Car Parts Are Welded in Automatic Machines. E. F. Ross. *Steel,* Vol. 91, July 4, 1932, pages 23-25, 28. Third article. A description of an automatic, hydraulic spot welder and other unique automatic welding equipment designed by Ford Motor Co. engineers with descriptions of the welding methods used in fabricating various steel parts and accessories of the Ford automobile. JN (11c)

Assembly Involving Many Welds Now Produced in Single Operation by Hydrogen Electric Welding Process. T. M. Rude. *Journal American Welding Society,* Vol. 12, Apr. 1933, pages 4-6. Description of hydrogen-copper welding process as applied to a receiver tank and a number of other small parts. Any assembly, the parts of which can be fitted together with good contact to which Cu can be applied in some form at or near the joints, can be hydrogen-copper welded. The joints are stronger than the adjacent metal. TEJ (11c)

The Welding of Cast Iron and Ferrous Alloys. Some Metallurgical Considerations. J. G. Pearce. *Welding Journal,* Vol. 30, May 1933, pages 134-142. Paper read before Midlands Branch, Institution of Welding Engineers, Jan. 20, 1933. Includes discussion. Deals with metallography of steel and cast iron, showing photomicrographs to illustrate the various modes of occurrence of C in these alloys and effect of various rates of cooling on their microstructures. Excellent oxyacetylene and electric arc welds can be made by using austenitic cast iron as a filler. TEJ (11c)

Examination of Welders. (Beitrag zur Frage der Schweisserprüfung.) P. Raczkowski. *Elektroschweissung,* Vol. 4, Feb. 1933, pages 31-32. The qualification of welders depends on the proper welding of a certain type of cross-piece according to the specifications. These specifications lack rules on the accurate determination of the welded cross-section. The author particularly discusses this point and describes a method for accurately determining the welded cross-section by taking a plasticine print of the weld. This method is supplemented by macroscopic examinations and photographs on the visible burnt-in area. GN (11c)

A Splendid Achievement of Welding Technique. (Eine Glanzleistung der Schweisstechnik.) E. A. Pfeiffer. *Der Autogen Schweisser,* Vol. 5, Sept. 1932, pages 200-201. Illustrated description of a welded Y-pipe of 6.5 m. length and 3.63 m. diameter of the inlet pipe and 2.55 m. diameter of outlet pipes. Work is constructed for a capacity of 24 m.^{3} water per sec. Kz (11c)

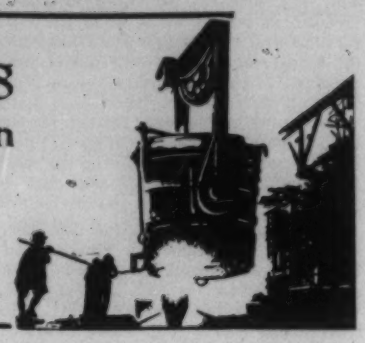
Arc Welding in Shipbuilding. *Iron Age,* Vol. 129, Feb. 25, 1932, page 502. Abstract of paper read by H. W. Pierce before Society of Naval Architects & Marine Engineers in New York. Material procedure and technique has outstripped design in application of arc welding to ship structures. Cites various advantages for fusion welding in general, and electric welding in particular. VSP (11c)

Ship-Welding Specifications of German Industry Standards and German Lloyd. (Über Schiffsschweissung nach den Vorschriften von DIN und Germanischer Lloyd.) R. Schmidt. *Schiffbau, Schiffahrt und Hafenbau,* Vol. 33, Mar. 15, 1932, pages 85-87; Apr. 1, 1932, pages 102-105; discussion: G. Wahl, June 1, 1932, pages 171-172; R. Schmidt, June 1, 1932, pages 172-175. After discussing remarkable advantages welding offers to ship building in comparison with riveting, Schmidt criticizes welding regulations of German Lloyd which submit welding operators of various ship yards to certain tests on which official recognition depends. Writer furthermore objects to exclusive admission of electric welding and introduction of new symbols as compared with generally adopted DIN specifications. New suggestions are not entirely clear. Writer critically discusses deficiencies of new regulations with reference to different types of seams and deplores lack of directions concerning testing method applied to welds. After critically considering various possibilities, author urges accepting the inspection according to Schmuckler consisting of drilling and etching tests. In the discussion, early history of welding in German ship yards and evolution of international regulations of the German Lloyd are dealt with. Attention is also directed to British regulations of ship-welding. WH (11c)

Fundamentals for Use and Welding of Steel Tubes in Building of Airplanes. (Grundlagen für die konstruktive Anwendung und Ausführung von Stahlrohrschweissungen im Flugzeugbau.) A. Rechtlich. *Autogene Metallbearbeitung,* Vol. 25, Sept. 1, 1932, pages 258-266. Weldability of normal and high-grade steel tubes is investigated and tensile values are derived from tests. German airplane builders use preferably Cr-Mo steel tubes of 0.25-0.35% C, 0.4-0.6% Mn, 0.15-0.35% Si, less than 0.04% P, less than 0.04% S, 0.8-1.1% Cr, 0.15-0.25% Mo. Average tensile strength was 75 kg./mm.^{2} with 8% elongation for unwelded tubes; welded showed 70 kg./mm.^{2} Both can be raised to 110-120 kg./mm.^{2}, but Cr-Mo wire must be used in welding. Sketches show manner of welding and kind of joints best applied. Practical hints are given to test the quality of welds. Ha (11c)

Are You Keeping Up-to-date on Modern Melting Practice?

The Abstracts tell what is going on.



Desulphurization of Cast Iron and Sulphur in Cast Iron. (Die Entschwefelung von Gusseisen und der Schwefel im Grauguss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Feb. 5, 1933, pages 48-49. Discusses detrimental effects of S on cast Fe and methods to regulate S content as the use of proper coke, addition of fluorspar, sufficient Mn content etc. It is finally discussed to what extent decrease of the S content is desired and correct. GN (12a)

New Deoxidation Method of German Silver and Nickel Castings. (Ein neues Verfahren zur Desoxydation von Neusilber- und Nickelguss.) A. Heinz. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Mar. 5, 1933, pages 99-101. Tests on German silver and Ni melts deoxidized with a new deoxidizer "Aluphosphin N" are described. This deoxidizer is claimed to reliably degasify and densify those melts which tend to porosity. GN (12a)

Basic Reduction Method in the Open Hearth Furnace. Forgings Made of Reduction Steel. (Basisches Reduktionsverfahren im Siemens-Martin-Ofen. Schmiedestücke aus Reduktionsstahl.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Apr. 30, 1933, page 249. Description of a new method of making basic open hearth steel. Process is characterized by reduction being carried on throughout the melting time. This is attained by working with a special slag. "Reduction steel" thus made differs from common basic steel merely as far as the Mn content goes, it is higher than in common open hearth steel, also containing .15-.25% Cu, thus having higher corrosion resistance. O, P, and S are lower. Reduction steel can be excellently forged. The mechanical properties are better, especially the notch toughness, even at subzero temperatures. Reduction steel with a tensile strength of 60 kg./mm.^{2} at —20° C. has a notch toughness of 8 mkg./cm.^{2} as compared with but 3 mkg./cm.^{2} of ordinary open hearth steel. GN (12a)

Composition and Use of Flux for Mg (Composition et mode d'emploi de flux assurant la protection du métal, son affinage et l'élimination des chlorures dans la fonderie du magnésium). R. de Fleury & A. Caillon. *Comptes Rendus,* Vol. 196, Jan. 3, 1933, pages 53-55; *Journal du Four Electrique,* Vol. 42, Feb. 1933, page 56. A suitable flux must protect metal during fusion, refine liquid and protect it during casting, and yet must not be incorporated in final metallic mass. Good results are obtained by successive use of 3 fluxes: one for use during fusion ($MgCl_2$ 60%, NaCl 40%); a second for refining the liquid (MgF_2 50%, B_2O_3 50%, or MgF_2 35%, BaF_2 15%, B_2O_3 50%); and a third for protection during casting (B_2O_3 15%, $Na_2B_4O_7$ 85%). JDG + OWE (12a)

Refining Methods for Gray Iron. B. F. Miller. *Foundry,* Vol. 60, July 1932, pages 22-23, 48. Control of S in cast Fe is important problem in foundry practice. In addition to S other occluded impurities, both gaseous and solid, are present in scrap, pig Fe or coke. Bullard Co., Bridgeport, Conn., refines metals with alkaline slags. S content of castings is reduced 30% with a reduction in direct cost per ton of metal from 4.5 to 8.9%. Further improvement in castings is accomplished by improvement in melting practice, installation of a forehearth and refining the metal from the cupola with fused soda ash. Describes tests applied to castings of different analyses to show their relative machineability. VSP (12a)

Use of Chips in Metal Foundry. (Ueber die Verwendung von Spänen in der Metallgiesserei.) G. Müller. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 16, 1933, pages 159-161. Author discusses various reasons against use of metal chips in melting of non-ferrous metals. Impurities and the methods of separating them (magnetic separators) are especially referred to. Besides Fe particles non-ferrous metal chips are frequently contaminated by white metal, special brasses, Al, etc. Various methods of purifying are discussed, suitable melting procedures are outlined. GN (12a)

New Metallurgical Methods. (Nouvelles methodes de metallurgie.) M. Perrin. *Revue de Métallurgie,* Vol. 30, Jan. 1933, pages 1-10; Feb. 1933, pages 71-84. A long series of experiments on plant scale with 15 ton ladles showed that the dephosphorization reaction under these conditions occurs in a very short time when the variables are properly attended to. The basis of the method, bringing together molten metal and fresh slag containing no P, depends for its efficiency on the thoroughness of the mixture of the two. A molten slag containing 3-10% SiO_2, 60-65% CaO, 20-35% FeO is placed on the bottom of the ladle and the metal is poured on it. In less than a minute, if the operation was done properly, the phosphorus was reduced as follows: from 0.436% to 0.045%, from 0.060% to 0.011%, from 0.022% to 0.007%. In consistency of P reduction method gives the same results as the usual metallurgical practice. Difference between P content in first and last ingots was of the order of 2%. Mixture of slag and metal must be thorough, because the direct pouring into the slag of steel through nozzle of a ladle effects P reduction from 0.171% to 0.067% only in ½ hour. Reaction is completed in less than one minute when steel is poured into ladle by jerking furnace, letting metal come in contact with the slag so violently that it almost emulsifies latter by the eddy currents created. Similarly to dephosphorization a steel can be deoxidized by dissolving its FeO in an appropriate slag. It must be free from FeO and very fluid. The final slag adopted consisted of 70% SiO_2, 25% Na_2O and 5% CaO. Using strong stirring as in the dephosphorization experiments O_2 content was reduced after this treatment: from 0.055% to 0.015%, from 0.054% to 0.017%, from 0.083% to 0.026%. Without intense stirring O_2 reduction did not take place. With the same quantity of identical slags the final O_2 content will be lower the lower is its original content. With same content of O_2 in steel its reduction would be greater the larger the amount of slag used. Better results can be obtained with a given slag when ½ of it is allowed to act, and then the second half. The more fluid the slag, the better is FeO removal. A comprehensive investigation of the properties of slag in the light of their FeO removal properties indicated that SiO_2 slags are too viscous for the use and, besides, do not have the true melting point. A mixture of 70 TiO_2 and 30 CaO gives a much greater fluidity at 1550° C. Additions of C and Mn to the metal before pouring it over the slag adds its deoxidizing effect to the action of the slag so that perfectly killed piping ingots were produced in several instances without using any deoxidizers. It was observed that after addition of Mn silicon content of the finished metal increased. An addition of 1.35% Mn raised the final Si to 0.15%, for example. Using special slags and methods it was possible, starting with 0.09 C, 0.12 Mn, 0.045 Si steel, to produce without any additions a steel containing 0.08 C, 0.09 Mn and 0.29% Si. Theoretical considerations are advanced to show that the degree of the deoxidation can be pushed even farther. JDG (12a)

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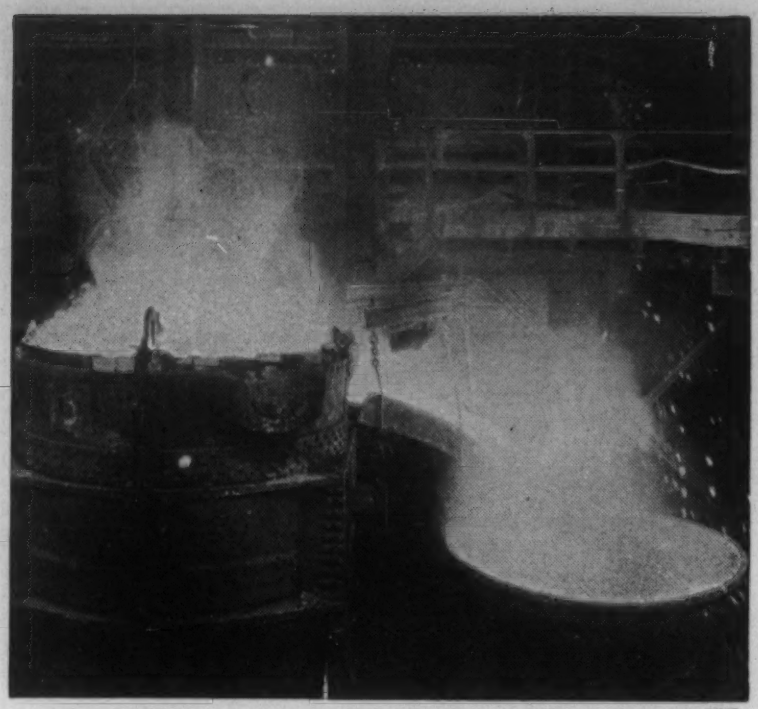

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Removal of Gases and Other Impurities from Aluminum and Its Alloys by Aluminum Chloride Combined with Other Salts. (Entfernung von Gasen und anderen Verunreinigungen aus Aluminium und seinen Legierungen mit Hilfe von Aluminiumchlorid in Verbindung mit anderen Salzen.) STEINHÄUSER. *Metallwirtschaft*, Vol. 12, May 19, 1933, pages 284-285. Gases may be absorbed by Al during melting in several ways, from the coke or gas used as fuel, O from the air with the formation of oxides and sometimes nitrides, H after reaction of the Al with moisture of the air, or H after reaction of impurities in the Al, such as nitrides or Na, with moisture of the air. Many of the commonly used fluxes contain hygroscopic moisture, which is undesirable. The ideal flux for Al should be absolutely dry, have a low viscosity when molten, remain in the molten metal for a considerable time, and form copious fumes, in order to purify the metal mechanically and chemically. A mixture of $AlCl_3$ and NaCl, in their molecular proportions, fulfills all these requirements. When 1% of this flux is thoroughly stirred into a 50 kg. ladle of Al the metal is freed from gas in 15 min. as shown by the vacuum test. CEM (12a)

High Frequency Induction Furnace. VII. Dephosphorization and Desulphurization in the Coreless Induction Furnace. (Zur Kenntnis des Hochfrequenz-Induktionsofens. VII. Die Entphosphorung und Entschwefelung in kernlosen Induktionsofen.) P. BARDENHEUER & W. BOTTENBERG. **Construction and Operation of a Coreless Vacuum Induction Furnace. VIII. (Bau und Betrieb eines kernlosen Vakuum-Induktionsofens. VIII.)** W. BOTTENBERG. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 15, No. 5, 1933, pages 49-58. The first part of the investigation brings the evidence that dephosphorization and desulphurization can be successfully carried out in coreless induction furnaces; although particularly in larger furnaces the slag has to be changed several times thus causing greater labor which is compensated for by the greater metallurgical working velocity on account of the greater reaction velocity which is due to the electrodynamical motion of the bath. The motion of the bath is the greatest feature of this type of furnace as it permits carrying out the slow reactions of dephosphorization and desulphurization economically. The motion increases with reducing frequency because of the increased current, and depends further on the shape and dimensions of the hearth. For a given frequency and furnace capacity the bath with the smaller diameter has the most active motion. Slag analyses and results of a number of melts are described. The second part of the paper describes an induction furnace in which metal can be melted in vacuo so that the gases can be exhausted. In this way it is possible to study the influence of gases on the quality of the melted metal, in particular the deoxidation process. The following table shows how much the vacuum process can improve the metal:

Metal	Original condition		Remelted in vacuum	
	% O_2	total gas cc./100 g.	% O_2	total gas cc./100 g.
Nickel	0.41	583.5	0.009	13.3
Ferrochrome (1% C)	0.067	149.8	0.001	6.3
Pig iron	0.009	14.3	0.005	6.8
Hard steel	0.014	27.5	0.003	4.0
Mild steel	0.027	54.9	0.008	5.3

17 references. Ha (12a)

Behavior of Gaseous Sulphur and Sulphur Balance in Basic Open-Hearth Process. (Ueber das Verhalten des Gasschwefels und die Schwefelbilanz beim basischen Siemens-Martin-Prozess.) F. EISENSTECKEN, E. H. SCHULZ & L. BIERNER. *Mitteilungen aus dem Forschungsinstitut der Vereingte Stahlwerke A. G. Dortmund*, Vol. 3, Dec. 1932, pages 19-39. Behavior of S originating from charge and additions and from the heating gases was followed during the basic open-hearth process. Absorption of gaseous S in melt is a function of temperature and of contents of CaO and FeO. Absorption can take place only in a reducing atmosphere, an oxidizing atmosphere desulphurizes the bath. Calcium fluoride exerts a very favorable desulphurization of the bath. A complete balance is given with particular reference to the fuel gas used in the Ruhr district. 6 references. Ha (12a)

Basic-Bessemer Process. F. KÖRBER & G. THANHEISER. *Foundry Trade Journal*, Vol. 47, Dec. 15, 1932, page 364. Summary of an investigation of behavior of most important elements during basic-Bessemer processes. Changes in concentration of Mn, P, S, O and N were investigated. Discontinuous changes are due to a sudden change of slag from acid to basic. Special attention was given to Mn content and to effect of O on mechanical properties. OWE (12a)

Some Theoretical and Practical Aspects of Gases in Metals. JACK H. SCAFF & EARLE E. SCHUMACHER. *Metals & Alloys*, Vol. 4, Jan. 1933, pages 7-12. Discuss various effects of gases in metals, formation of blowholes in castings, changed magnetic properties in Fe, effects of O and N in surface hardening of Al. Nature of reaction resulting in solution of gases in molten metal is discussed. Increase in solubility with increasing temperature is shown to mean that reaction is tions. Organic liquids whose solubility for gases increases with increased temperature are cited. Effects of gas pressure on solubility of gas in metal are discussed and theory of Sieverts' square root law given. Solubility of O in Ag is discussed at some length giving tabulated data of Steacie and Johnson. Theory and practicability of vacuum analysis of metals for gases are discussed. The development and advantages of commercial vacuum melting of alloys are discussed. 23 references. WLC (12a)

Development of Inclusions During Manufacture of Steel (L'évolution des inclusions dans l'élaboration des aciers). RENÉ PERRIN & ALBERT PORTEVIN. *Comptes Rendus*, Vol. 196, May 1, 1933, pages 1321-1323; *Genie Civil*, Vol. 102, May 1933, page 453. A distinction is made between mechanical (exogenic) inclusions (e.g., slag) and inclusions arising from chemical changes among the impurities and added elements in the body of the liquid metal (endogenic). The authors are chiefly interested in inclusions of the first kind, particles of slag being regarded as in chemical equilibrium with the metel. The nature of this equilibrium is studied from various points of view; in particular, a study of reaction-rate in mechanical emulsions of slag and metal shows that equilibrium is rapidly established when the slag is sufficiently fluid. The conclusions are confirmed by micrographic investigations. JDG + OWE (12a)

Methods for the Determination of the Viscosity of Slags. (Ueber Verfahren zur Bestimmung der Viskosität von Schlacken.) K. A. POHLE. *Mitteilungen aus dem Forschungsinstitut der Vereinigte Stahlwerke, A. G. Dortmund*, Vol. 3, Dec. 1932, pages 59-80; abstract, *Technische Blätter der deutschen Bergwerkszeitung*, Vol. 23, Apr. 2, 1933, page 200. Reactions between slag and metal are important in many metallurgical processes. As velocity of a process depends often on viscosity of slag and latter again on temperature the various methods for the determination of coefficients were compared and certain rules developed for comparable measurements. A torsion method was developed which was very useful and exact for laboratory purposes; a crucible containing the slag was rotated and the velocity with which an immersed rod is taken along is measured. 42 references. GN + Ha (12a)

Influence of Deoxidation on the Quality of Steel. S. L. LEVIN. *Domez*, No. 2-3, 1933, pages 34-58. Influence of deoxidizing practice was studied on 32 heats with 0.1% C, 13 heats containing 0.2-0.3% C and 18 heats with 0.5-0.6% C made in open hearth furnace. Herty's method was used for determining O_2 content by introducing Al in test spoons. Cleanliness was determined by microscopic estimation. Individual heat results varied considerably from the average. Mn introduced in the furnace affects O_2 only slightly. In small quantities it can be introduced in the ladle, in larger should be added in the furnace. Al does not dirty the metal in small quantities. It is needed for complete deoxidation of low C steels. With high C, Mn and Si its use is not required. For complete deoxidation of 0.1 C steel 0.30-0.35% ferromanganese, 0.20-0.22% ferrosilicon and 0.05% Al are needed. Fe-Mn and Fe-Si are mixed together and added to the ladle. For 0.6% C steel 0.7-0.8% Fe-Mn in the furnace and 0.5% Fe-Si in the ladle give the best results. Steel with 0.25% C, 1.0% Mn calls for 0.8% Mn in the furnace and 0.30% Fe-Si and 0.04% Al in the ladle. Detailed data given. (12a)

Casting & Solidification (12b)

Die Casting. A. H. Mundey. *Metallurgia,* Vol. 7, Apr. 1933, pages 194-196; *Metal Industry,* London, Vol. 42, Jan. 13, 1933, pages 51-56. General discussion of permanent-mold castings and die castings. JLG + Ha (12b)

The Action of Cooling Bodies and Chaplets in Cast Steel and Cast Iron. (Das Verhalten von Kühlkörpern und Kernstützen beim Eingiessen in Stahl und Grauguss.) E. Lanzendörfer. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 53, Dec. 25, 1932, pages 515-516. See *Metals & Alloys,* Vol. 4, May 1933, page MA 150. GN (12b)

Ingots for Ferro-Alloys and Calcium Carbide. (Type de lingotiere pour ferros et carbure.) Ch. Louis. *Journal du Four Electrique,* Vol. 42, Apr. 1933, page 129. The ingot molds which were in use for more than 20 years are in the shape of a truncated cone of much larger diameter than height. The body is a heavy Fe or steel casting. The bottom consists of a lid lined with some good refractory. When the refractory becomes worn the lid is separated from the body and relined. JDG (12b)

The Casting of Magnesium Alloys. E. R. Thews. *Chemical Trade Journal & Chemical Engineer,* Vol. 90, Apr. 22, 1932, page 405. Abstract of an article in *Canadian Chemistry & Metallurgy.* See *Metals & Alloys,* Vol. 3, Aug. 1932, page MA 252. JN (12b)

Question of Manufacture of Pressure Pipes with Bell Joints. (Zur Frage der Muffendruckrohr Herstellung.) R. Ardelt. *Die Giesserei,* Vol. 20, Feb. 3, 1933, pages 48-50. After a brief historical review of manufacture of cast pipes a combined ramming and centrifugal casting method for making cast pipes and equipment of a plant are described. Ha (12b)

Getting the Most Out of Die Castings. *Product Engineering,* Vol. 4, Feb. 1933, pages 61-62. Examples are given to show how even very intricate shapes and complex parts of gears for clocks, etc. can be commercially manufactured by die-casting. The standard Zn base alloy for die-casting has 2.5-3.5% Cu, 3.5-4.5 Al, 0.02-0.10 Mg, 0.1 Fe, 0.01 Pb, 0.005 Cd, 0.005 Sn; it possesses a tensile strength of 45000-48000 lbs./in.^{2} with an elongation of 4-6%, a shearing strength of same value. Brinell hardness of 85-90, and a very small thermal expansion. Al-alloys are used in almost any composition, they have around 30,000 lbs./in.^{2} tensile strength. Cu-alloys give still higher strength; a typical composition is Cu 57-59%, Zn 40-42%, Sn 0.5-1.5%, Al 0.1%, Pb 0.75% max, Mn 0.25% max.; tensile strength is 65000-75000 with an elongation of 15-20% and a Brinell hardness of 130-140. "Brastil" a Cu-Si-Zn alloy has 90000-95000 tensile strength with a yield point of 68000-70000 lbs./in.^{2}, elongation 10-17% and a Brinell hardness of 160-180. A table shows casting limits of typical die-casting alloys, max. weight of casting, minimum wall thickness, dimension of holes, variations from drawing dimensions, etc. Ha (12b)

Handling, Stripping and Soaking Ingots. *Iron Age,* Vol. 129, Jan. 28, 1932, pages 288-289. Describes ways by means of which quality of ingots can be saved or improved and gives reasons for some of practices recommended. Principal considerations in pouring and preparation of ingots are: (1) Resulting surface conditions; (2) Central unsoundness and segregation; and (3) Crystalline structure and accompanying interdendritic segregation, which sometimes is a factor in determining the fitness of steel for certain purposes. VSP (12b)

Silumin Die Castings. (Silumin Kokillenguss.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Feb. 5, 1933, pages 55-58. After a few introductory remarks on die castings in general and the factors affecting the mechanical properties and the efficiency of production, casting and tensile properties of Silumin and common Al-mold casting alloys and the various difficulties in casting the testing samples are discussed and compared. The structure of Silumin mold castings as well as its effect on the mechanical properties are described. GN (12b)

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Rolling (12c)

Investigations of Stress Distribution in Roll Pass. (Untersuchungen über die Spannungsverteilung in Walzspalt.) E. Siebel & W. Lueg. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 15, No. 1, 1933, pages 1-14. Distribution of stresses in the material in the range where it is between the rolls was at first analyzed theoretically and then determined experimentally by measuring pins inserted in the roll; the vertical rolling pressure exerted on the pin was measured piezo-electrically. Both theoretical and experimental results agree very well; the center of gravity of the points of attack of the total vertical rolling pressure lies normally between ½ and 1/3 of the pressed length from the outgoing end of the rolls. The influence of the horizontal forces on the specific roll pressure increases under otherwise similar conditions, with decreasing initial height of the material to be rolled. In draw-rolling, specific pressures are lower than those under driven rolls. The relative dislocation of the material with respect to the roll surface seems everywhere to take place in the direction of greatest pressure gradient. In center of bar and in flow plane, relative movement of material takes place perpendicularly to the direction of rolling with a flow component transverse to the axis of the bar. Oscillograms of the momentary pressures in rolling, charts and diagrams illustrating distribution of stresses and flow lines, supplement the paper. 14 references. Ha (12c)

Design of Continuous Mills. A. Vinogradov. *Domez,* No. 2-3, 1933, pages 1-11. Principles involved in design of continuous mills are presented mathematically and an example of calculation is given. (12c)

Forging (12d)

Ford Axle Shafts Heated and Forged Automatically. E. F. Ross. *Steel,* Vol. 91, Aug. 1, 1932, pages 23-25, 28. Fifth article. A description of automatic equipment used by the Ford Motor Co. for heating, forging and handling rear axle shafts. Construction and operation of the electric furnaces, forging machines, and conveyor systems are described in some detail. Automatic production of rear axle housing flanges and connecting rods is also described. Safety features are pointed out. JN (12d)

Forging Industry in 1932. Macdonald S. Reed. *Heat Treating & Forging,* Vol. 19, Jan. 1933, pages 7-10. Reviews "Production and Capacity in the Drop Forging Industry" prepared by the United States Bureau of Foreign and Domestic Commerce, and improvements in hammers. MS (12d)

Typed Forging Dies Have Longer Life and Cost Less to Make. E. F. Ross. *Steel,* Vol. 91, Aug. 15, 1932, pages 21-23. Sixth article. Typed dies are used by the Ford Motor Co. for a wide variety of lighter duties. These dies are made by driving a hardened "master type" into a heated block of die steel. The master type is machined from regular hammer grade die block steel. Exact allowance must be made for shrinkage of both the typed die and the final forging. Working temperature is carefully maintained to control amount of shrinkage and formation of scale is prevented so that typed die requires no machining before use. In some cases, master types are made in quantity from a "master hammer die" and that, in turn, from a "master-master die" which is itself, machined. It is claimed that typed dies cost less and produce 25% more forgings than machined dies. JN (12d)

Hot-Pressing of Hard Brass. (Das Warmpressen von Hartmessing Ms58.) R. Hinzmann. *Zeitschrift für Metallkunde,* Vol. 25, Mar. 1933, pages 67-70. Tendency of brass with 58% Cu, showing a duplex $\alpha + \beta$ structure, to form large crystals which tear during pressing operations can be avoided by the use of shorter press-pins and of more rapid press-velocity. Various details in the hot-pressing of this material are discussed and illustrated. RFM (12d)

New Forging and Drop Hammers. (Neue Schmiede- und Gesenkhämmer.) H. Kalpers. *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Feb. 19, 1933, pages 102-103. Description of new types of German forging hammers with special reference to those of the Beché & Grohs Co. Hückeswagen and the Eumuco Co., Leverkusen-Schlebusch. The construction of the Beché hammer is unique in that a new principle of working is applied. Two hammers of equal weight, the one from above, the other from below hit the working piece with same speed. GN (12d)

Getting Long Life from Dies. Bernard Thomas. *Heat Treating & Forging,* Vol. 18, Dec. 1932, pages 685-688. "Caving-in" of walls of a die with a deep or very uneven sinking may be due to failure of softer parts of impression. This may be remedied by treating dies after sinking, but if only a light skin hardness is obtained "caving-in" will probably occur. Alternative is to treat die in a semi-finished state of sinking, allowing just sufficient metal to be removed in order to clean up impression. When machining and sinking become difficult, die-block can be tempered in 2 stages, first at customary temperature and second at a higher temperature for a short time. This results in an outside skin which can be more easily removed. "Corrugated" impressions or "crocodile markings" are due to either working temperature's exceeding that at which dies were tempered or to too short a tempering time. Growths on die impressions in as-forged condition are usually due to increase in size of grains during working. Tempering will obviate this trouble. MS (12d)

Shearing & Punching (12e)

Frame Deflection in Punch Presses. Albert Clemens. *American Machinist,* Vol. 77, Feb. 15, 1933, pages 101-103. Tests have shown that the C-type press with a steel frame is less liable to unsymmetric deformation than with a cast iron frame so that the die presses uniformly on the work and wears less. Presses should not be specified by pressure alone but with regard to the work to be done, large or small pieces. Ha (12e)

Commercial Types of Power Presses. Pt. XIII. Follow Die Design for High Production Presses. E. V. Crane. *Metal Stampings,* Vol. 5, Feb. 1932, pages 99-102, 110. Includes brief description of investigation of the directional properties of quarter hard Tobin bronze strip. Metal was placed in a round blanking die in a testing machine and pressure was applied until fracture just started. Metallographic examination showed that the metal had the greatest plasticity where the line of shear cut crossed the grain. When shear cut was parallel to the grain, metal was more resistant to deformation and the fracture started more quickly. MS (12e)

Steel Barrels From Flat Sheets in One Hour. *Iron Age,* Vol. 129, Apr. 14, 1932, pages 876-878, Adv. page 20. High speed equipment enables Atlas Barrel Co., Bayonne, N. J., to manufacture barrels from raw material and deliver them within a few hours after receipt of order. Describes procedure. VSP (12e)

Extruding (12f)

Electrolytic Condensers Produced in Aluminum by Impact Extrusion. *Iron Age,* Vol. 130, Aug. 11, 1932, page 220. By means of this recently developed type of extrusion it is possible to convert a simple blank of Al into semi-fabricated tubular anode and cathode cans. Anode is made from high purity Al and cathode from commercially pure metal. Articles may be formed in one operation by this process. VSP (12f)

Hydraulic Presses for Extruding Non-Ferrous Metals. E. Pfann. *Engineering Progress,* Vol. 13, Apr. 1932, pages 94-96. G. A. Dick in 1894 applied for a patent for first hydraulic extruding press. Process is now successfully used on Cu, brass, Al, Zn, Pb, cupro-nickel, Monel metal, Al bronze and duralumin. Illustrates and briefly describes a 3000 ton press. It will handle billets 16" diameter 36" length, making tubing up to 12" diameter, strips 14" wide, wire down to .24" diameter. Briefly describes process and mentions some uses of extruded parts. RHP (12f)

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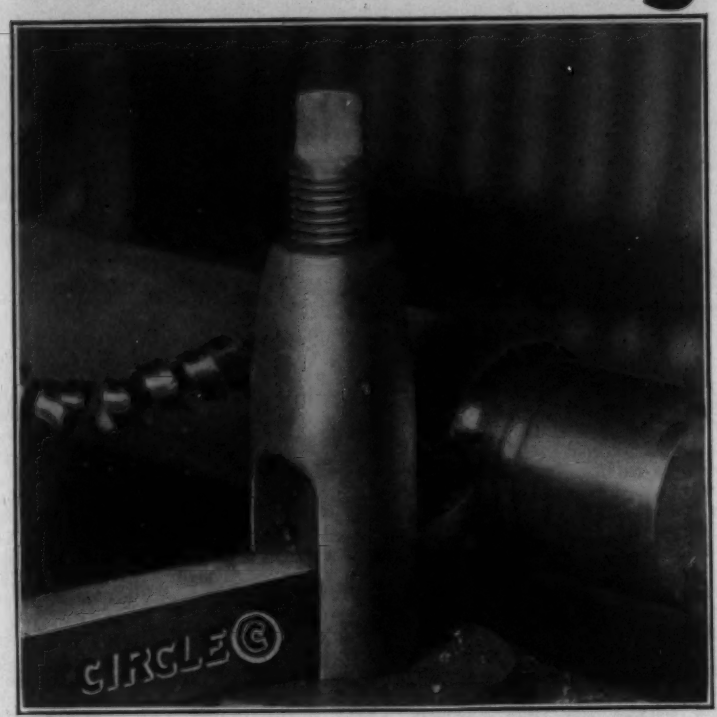

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Machinability of Rustless Steel. *American Machinist,* Vol. 76, Sept. 14, 1932, page 1007. Describes tests which show that cutting speed of 18-8 steel could be increased from 60 to 100 ft./min. and threading speed from 7 to 24 ft./min. if steel contained 0.21% Se. Brinell hardness both with and without Se was 255. Ha (12g)

Torque Required to Tap Cast Iron. *American Machinist,* Vol. 76, Oct. 12, 1932, pages 1069-1070. Curves and tables show required torque in inch-pounds for different tap diameters and different percentages of thread. Ha (12g)

On the Wear of Lathe Tools. SHIZUO DOI. *Journal Society of Mechanical Engineers,* Tokyo, Vol. 35, Oct. 1932, pages 1026-1030. Experiments were carried out to find most economical cutting speed when a fine cut is employed in machining steels with varying percentages of C. Wear appearing on the front clearance face of tools were measured under microscope. Times required for beginning of rapid wear of tool were taken as a measure of durability, and vertical cutting force was measured while wear of the tool increased. Test results are presented in tabular and graphical form. Kz (12g)

Characteristics of Turning and the Laws of Shearing of Metals (Le Caratteristiche dei Forni et le Leggi sul Taglio dei Metalli). T. BRUZZONE. *L'Industria Meccanica,* Vol. 15, Jan. 1933, pages 1-8. The equation of Taylor for the power required for the working of metals is discussed with respect to the material constants and influence of depth of the cut, feed and velocity of cutting. The results are shown in curves from which the best grading of steps in cutting can be taken. Ha (12g)

Standard Tests for Metal-Cutting Tools. ROBERT C. DEALE. *Industrial Standardization,* Vol. 4, Apr. 1933, pages 66-69; *Mechanical Engineering,* Vol. 54, Oct. 1932, pages 708-710. Standardization of following elements in testing metal-turning tools will permit direct comparisons of different sets of tests: (1) Form, (2) tool life, (3) metal cut, (4) tool, (5) preparation of the work piece, (6) test cuts, and (7) coolant. Standards are proposed AHE + Ha (12g)

Cemented Carbide Cutters in Milling. R. E. W. HARRISON. *Iron Age,* Vol. 130, Sept. 15, 1932, pages 408-410. Emphasizes opportunity offered to engineers to effect reduction in amount of idle time that characterizes milling practice. Tungsten carbide cutters will operate about 10 times number of hours previously obtained on same work with high-speed-steel cutters. VSP (12g)

Accurate Machining, As Typified in Small Arms Manufacture. HERBERT R. SIMONDS. *Iron Age,* Vol. 129, Feb. 4, 1932, pages 324-327. Describes procedure at plant of Colt Patent Firearms Mfg. Co., Hartford, Conn. New product developed by Company, a pistol known as 0.22 Ace, and a description of some of manufacturing details illustrates many problems of accurate machining in production of small arms. Includes discussion of working of S.A.E. 1350, 1035 and 1085 steels into pistol barrels, receivers and hammers. VSP (12g)

Studies on the Boring and Grinding of Iron, Copper, and Aluminum Alloys. (Untersuchungen über das Senken und Reiben von Eisen-, Kupfer- und Aluminiumlegierungen.) H. SCHALLBROCH. *Zeitschrift für Metallkunde,* Vol. 24, Dec. 1932, pages 308-309. A study of the cutting forces (axial pressure and moment of rotation) in dependence upon size of piece and cutting technique, and also of the variation of the apparent grinding diameter from the finished cylinder diameter under different cutting conditions. The following alloys were studied: cast Fe, medium C steel, Cr-Ni steel, cast brass and bronze. Pb-Sn bronze, pure Al, Silumin, Lautal. Curves are given for cutting force (axial pressure and also moment against feed) for these alloys under different conditions with respect to diameter, feed, depth of cut, cooling agents, form of piece. A table lists the "over-diameter" in grinding as affected by different types of lubricant. RFM (12g)

The Present Status of Cemented-Carbide Tools. MALCOLM F. JUDKINS. *Machinery,* Vol. 38, May 1932, pages 643-649. Co is used as the cementing medium for W-carbide grains. Steel has a maximum Brinell of 800, W-carbide 1800-2400 Brinell. Transverse strength of W-carbide 180,000-350,000 lbs./in.^{2}. Compressive strength 500,000 lbs./in.^{2}. Gives many suggestions for correct use of W-carbide tools and for their design. 2 tables present data on results obtained in machining and milling various metals with cemented carbide tools. RHP (12g)

Modern Milling in Automobile Construction. (Neuzeitliches Fräsen im Automobilbau.) JOSEF SCHMITT. *Die Werkzeugmaschine,* Vol. 37, Feb. 15, 1933, pages 41-43; Feb. 28, 1933, pages 71-74; Mar. 31, 1933, pages 121-122. Discusses milling in automobile construction with special reference to modern devices which are to effect a saving in time, as high quality milling cutters, high speed machines, high speed centering devices, etc. Milling of various automobile parts is described. GN (12g)

Economic Factors Affecting the Use of Carbide-Tipped Milling Cutters. MILLARD ROMAINE. *Machinery,* Vol. 38, May 1932, pages 665-669. Factors involved in selection of a milling cutter for a specific job are: (1) type of cutter required, (2) material, (3) production required and methods used to obtain it, (4) finish required, (5) rigidity (or lack of it) of work, (6) milling machine available, (7) first cost of cutters, (8) cost of cutter upkeep. RHP (12g)

A Relation Between the Roughness and Mechanical Properties of Finished Surface of Metal. TOSIO NISHIHARA, KYUJIRO KINO & YOSHIYASU KAWAKURA. *Journal of the Society of Mechanical Engineers,* Tokyo, Vol. 35, Oct. 1932, pages 1017-1025. Paper read before 2nd General Meeting of Society of Mechanical Engineers, April 7, 1932. Degree of roughness of a finished surface of metal is indicated by 3 elements: (1) number of cutting strokes per unit breadth, (2) inclination of grooved surface and (3) smoothness of inclined surface. Measurement of (2) and (3) is performed by the "Arasa-meter" designed by authors and intended for determining the cutting ability of tools. Kz (12g)

Experiments with Cemented Tantalum Carbide for Turret Lathe Operations. M. E. LANGE. *Machinery,* Vol. 38, May 1932, pages 655-657. Tantalum carbide will successfully cut steel where W-carbide fails. Tantalum carbide does not crater, permitting grinding of a groove in cutter which will curl chip tightly. Presents suggestions as to how to use and gives results of experimental work as to feed, cut, speed and power. RHP (12g)

Some Factors that Affect Machine Tool Prices. JOSEPH GESCHELIN. *Automotive Industries,* Vol. 68, May 20, 1933, pages 603-605. Points to demands for better quality, better surface finish, closer tolerances, finer clearances, all at lower costs. With regard to purchase and sale of machine tools and incidental service, a recent proposal concerns the adoption of a standardized contract form in the following points: (1) base price of machine; (2) separate price for tooling; (3) service charge for set-up and demonstration. New types of machine tools possess the very features which define a profitable investment, that is, they possess great flexibility and universality of application. DTR (12g)

Drawing & Stamping (12h)

Forces and Power Requirements for Cold Drawing Wire. Pt. III. J. H. Hitchcock. *Rolling Mill Journal*, Vol. 7, No. 2, 1932, pages 107-114. Chiefly an analysis of work of Pomp, Siebel, and Houdremont published in *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung*, Vol. 11, No. 4, 1929. Their results have been converted into English units. MS (12h)

Notes on Tinplate. D. W. Jenkins. *Machinery*, London, Vol. 41, Jan. 26, 1933, page 494. Methods in production of tinplate objects are dealt with and attention is called to importance of working tinplate at right angles to the direction of rolling and grain. Kz (12h)

Dies for Wire Manufacture. R. Saxton. *Mechanical World & Engineering Record*, Vol. 92, Nov. 18, 1932, pages 479-480. The advantage of steel for wire-drawing dies is due to the ease with which it can be reset when the bearing portion shows signs of wear. Hand-setting gives a smoother surface than drill-setting. Cast iron dies, although cheap, cannot be reset to the original size, and have the tendency to spoil the wire by splitting. The length of bearing surface between the die and wire determines the reduction obtainable. Kz (12h)

Why Well-Rounded Designs make Economical Stampings. J. K. Olsen. *Product Engineering*, Vol. 4, Feb. 1933, pages 50-52. A few typical examples and several comparative designs illustrate how proper application of radio in bends and forms of stampings may lead to considerable savings in material and even time of production. Ha (12h)

What Is Ahead In Wire Drawing. W. W. Macon. *Iron Age*, Vol. 129, Apr. 7, 1932, pages 819-821, adv. page 24. From an interview with Kenneth B. Lewis. Most portentous change that may come is the general use of larger wire rod possibly 5/6" in diam. since scope of continuous drawing has been extended. Within a few years dies will be far in advance of other details of wire making process. Changes in cleaning of wire is probable. Revolutionary developments in galvanizing predicted. Periodic testing, renewal of acid, flux and spelter baths, do not make coating uniform at present time. X-ray studies may prove helpful. VSP (12h)

Lubrication of Carboloy Dies. J. R. Longwell. *Wire & Wire Products*, Vol. 8, Jan. 1933, pages 9-13, 26. Proper lubrication of wire drawing with dies of carboloy, i.e. of tungsten carbide, tantalum carbide or a mixture of the 2 cemented with Ni, Co, or another binder, is discussed under consideration of the 4 principal items: nature of substances forming the 2 surfaces in contact, their smoothness, presence or absence of any lubricant between surfaces and pressure per unit between surfaces. Shaping of dies, preparing rods for drawing, quality of lubricants and eventual harmful effects on die and wire, dry drawing and coating of wire is fully treated. Ha (12h)

Converting the Scrap of a Non-Ferrous Tube Mill into Valuable Stock. Gilbert Evans. *Metallurgia*, Vol. 7, Dec. 1932, page 55. Recommends drawing tube ends into smaller tubing, and shows drawing bench suited for such work. JLG (12h)

Modern Stamping. (L'Emboutissage Moderne.) P. Devaux. *Revue Industrielle*, Vol. 62, June 1932, pages 289-297. Methods of stamping and machines used are described. Among machines given as examples is a press of 1300 ton capacity weighing 255 tons. FR (12h)

The Manufacture of Smoothly Drawn Pipes. (Die Fabrikation von blank gezogenen Rohren.) W. Greiner. *Das Werkzeug*, supplement to *Maschinenkonstrukteur-Betriebstechnik*, Vol. 8, Aug. 10, 1932, pages 95-96. Discusses drawing, fusion welding, annealing and finish drawing of pipes including various equipment. GN (12h)

Pickling (12i)

The Evaluation of Inhibitors. (Über die Bewertung von Sparbeizpräparaten.) H. Pirak & W. Wenzel. *Chemiker-Zeitung*, Vol. 56, Mar. 9, 1932, pages 193-194; Mar. 16, 1932, pages 214-215. The requirements for a pickling solution inhibitor are that it should decrease the amount of Fe dissolved by acid, not increase the required pickling time, produce a smooth surface, and not weaken too rapidly in its efficiency. In the laboratory the effectiveness of an inhibitor can be determined either by the loss in weight of Fe samples in acid solutions with and without inhibitors or by the volume of H_2 evolved from solutions with and without inhibitors. The samples should be of the same grade of material and should have the same surface condition. It is often better to remove the oxide before the test. Wire is suitable for the tests. The acid should be of the same strength as used commercially. The inhibitor itself should be tested for acid and allowance made if it does contain acid. The temperature and time of the tests should be held constant. Various concentrations of the inhibitor should be tested and the inhibiting strength reported as a function of the % inhibitor in the acid. Both methods are satisfactory, but the H_2 method gives better checks and no weighing of samples is necessary. It is recommended to use .7 mm. dia. wire, 1 m. long, wound into a spiral. The wire should be cleaned to remove grease, dipped for 30 min. in 3 *N* HCl at 30° C. and rinsed. 3 *N* HCl is then used as a pickling solution at 20 and 30° C. Samples are immersed in solutions containing no, .2, .5, 1, 2 and 5 g. of inhibitor/l., and the volume of H_2 evolved is measured. The efficiency of the inhibitor is apparently greater by the H_2 than by the loss in weight method because of the slight H_2 solubility in Fe and in HCl. This should be corrected for. CEM (12i)

Continuous Pickling Process in a Bolt and Nut Factory. *Mechanical Handling & Works Equipment*, Vol. 20, Mar. 1933, pages 81-82. Pickling equipment to handle 80 tons per day of coiled wire rod is briefly described. The acid tank is 40 ft. long, divided into 6 compartments (5 for acid, 1 with water jets for rinsing) each 5 ft. 5 in. by 6 ft. 6 in. deep, and built of reinforced concrete lined with a double layer of acid-resisting brick set in Basolit cement. A seventh compartment contains a lime bath. JCC (12i)

Pickling for Plating. C. M. Hoff. *Cadalyte Service Bulletin*, Vol. 1, Jan. 1933, 11 pages. Chemistry of the process of pickling Fe and steel in preparation for plating is discussed for various acids. Inhibitors and acid brittleness are discussed in a general way. See also *Metals & Alloys*, Vol. 3, May 1932, page MA 138. HWG (12i)

Cold Working (12j)

Cold Metal Working. H. G. Povey. *Institution of Production Engineers*, London, Vol. 11, July 1932, pages 150-160. Includes discussion. Paper presented at Institution of Production Engineers, Coventry Sect. Advantages of cold metal working and machines and tools used are discussed mainly from the standpoint of the mechanical engineer. Kz (12j)

Maintenance of Cold Roll Forming Equipment. D. A. Johnston. *Metal Stampings*, Vol. 5, Mar. 1932, pages 197-200. Deals with those parts which are subjected to most wear and their repair and replacement. Discusses certain aspects of roll regrinding. MS (12j)

Bending and Coiling Devices Applied to Cold Roll Forming Machines. D. A. Johnston. *Metal Stampings*, Vol. 5, Feb. 1932, pages 113-116. Describes uses of these devices to make continuous the process of forming and bending flat stock to desired sections. MS (12j)

Design Principles of Cold Roll Forming Machines. D. A. Johnston. *Metal Stampings*, Vol. 5, Jan. 1932, pages 55-58. Summarizes salient points in the design of a machine for a single purpose job and of a machine for rolling a varied line of products. MS (12j)

Effects of Strain Hardening on Mechanical Properties of Aluminum and Its Alloys. W. C. Aber. *Metal Stampings*, Vol. 5, Mar. 1932, pages 169-172, 204-205. Important factors which affect strain hardening of Al and its alloys are chemical composition of the metal, and condition of material previous to, temperature of metal during, and rate of strain hardening. Describes and illustrates by graphs effects of cold working on mechanical properties. Increase in tensile strength and in Brinell hardness is proportional to increase in cold working, the relationship being linear to about 80% reduction of cross-sectional area. Beyond 80% reduction, increase in these properties continues at a much greater rate. From 0-20% reduction of cross-sectional area, yield strength increases at a much greater rate than does tensile strength. As amount of cold working is increased, % elongation decreases. The decrease occurs rapidly from 0-20% reduction of area. Table shows effects of cold working:

Temper	Approx. Reduc. of Area by Cold Working %	Tensile Strength lbs./in.^{2}	Yield Strength lbs./in.^{2}	Elongation in 2 in. %	Brinell Hardness
		Commercially-pure Al (2S-99% Al)			
Soft	0	13,000	4,000	35	23
Half hard	37	17,000	14,000	7	32
Hard	75	24,000	21,000	5	44
		Al-Mn Alloy (3S-1.25% Mn)			
Soft	0	16,000	5,000	30	28
Half hard	37	21,000	18,000	6	40
Hard	75	29,000	25,000	4	55

MS (12j)

On Velocity of Elimination of Work Hardening of Deformed Metals by Crystal Recovery and Recrystallization. (Über die Geschwindigkeit der Entfestigung verformter Metalle durch Erholung und Rekristallisation.) Werner Globig. Doctor's thesis, Technische Hochschule Breslau, July 1932, 41 pages. In order to study conditions of crystal recovery and recrystallization cylindrical samples of Cu and Krupp soft Fe were upset at certain temperatures in a drop hammer, left in a furnace at same temperature for elimination of work hardening and their Brinell hardnesses finally determined. Under testing conditions crystal recovery starts before recrystallization eliminates work hardening. Whereas for Cu the share of recovery on the total effects of elimination of work hardening is relatively small, recovery has largest share in elimination of work hardening in Fe. Conditions for various capacities of recovery of different metals could not be established. Tests furthermore prove that recrystallization may occur while mechanical effects of work hardening are still considerable. Many changes of space lattice which are due to work hardening or are cause of this phenomenon are still present while recrystallization proceeds, and, therefore, must have a direct bearing on it. Point of inversion on curves of total effects of elimination of work hardening is due to superposition of effects of crystal recovery and recrystallization. After a short annealing time nuclei of recrystallization are apparent but, at first, their number is so small that new grains have no bearing on process of elimination of work hardening. Only after crystal recovery has proceeded to a considerable extent does recrystallization begin rapidly. Resistance to deformation then decreases further due to appearance of a large number of new, non-workhardened grains. For equal degrees of deformation a larger initial grain renders more difficult beginning of recrystallization. Velocity of elimination of work hardening increases with extent of initial work hardening. When a material has been work hardened to various extents but work hardening has then been eliminated to same extent velocities of elimination of work hardening are still different. In appendix interesting observations on formation of slip planes in Cu are reported. 16 references. GN (12j)

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Read these abstracts and be well informed. Sections 12a on "Melting and Refining," 12b on "Casting and Solidification" and 23 on "Furnaces and Fuels" also contain information of value to you.

The Fundamentals of Brass Foundry Practice. R. R. CLARKE. *Metal Industry,* London, Vol. 41, Aug. 12, 1932, pages 147-148. Some practical data with regard to mixing alloys, fluxes, melting and pouring temperatures are given. The electric furnace is seen as the one generally used in the future for melting, both of the arc and induction type. The furnaces should be kept clean and free of slag, and lined with strictly neutral linings. The metal charges should be free of sand, oil, carbon, insulation, etc. Temperature and current input should be kept absolutely uniform and constant. No fluxes or coverings are used in the electric furnace. A ratio of 50 to 50 of old and new material gives good results; this ratio can change from 60/40 to 40/60. In making an alloy the metal with the highest temperature should be melted first. Metals of higher than Cu melting point are best introduced in the concentrated form which means usually a prepared alloy rich in the higher melting metal. Pouring temperatures are very important and for practically all non-ferrous metals and alloys, have a narrow range. An alloy of 78 Cu, 16 Pb, 4 Sn and 2 Zn has the best pouring temperature at 2150° F., the safe range being between 2110° and 2175° F. Pouring should be done as close as possible to the furnace and as fast as possible. Ha (22)

Evolution of the Foundry. IV. Snap-Molding. (Evolution de la Fonderie. IV. Le Moulage par Moites.) M. CONSTANT. *Revue de Fonderie Moderne,* Vol. 26, Dec. 25, 1932, pages 463-466. Several examples of assembling of molds and mold parts, heating and drying and proper patterns are described. Ha (22)

Foundry Fair Leipzig 1933. (Die Giessereimesse Leipzig 1933.) JOH. MEHRTENS. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 2, 1933, pages 131-137. Extensive illustrated description of foundry exhibit at Leipzig Spring 1933 Fair. There are discussed exhibitions of melting furnaces of various types, blowers, compressors, drying ovens, sand slinger equipment, molding machines, new types of molding plates, cleaning equipment for castings, grinding machines, hoisting devices and conveyor systems, special cast irons, alloying metals, refractory materials, fluxes, material testing machines, microscopes and measuring instruments as pyrometers, temperature controllers, gas analyzers, etc. GN (22)

Crooked Core Makes Straight Pipe. F. H. MOREHEAD. *Iron Age,* Vol. 129, Apr. 7, 1932, pages 826-827, adv. page 22. Describes a special device for making crooked core which, when pressure of metal hits it, straightens out so that resulting pipe is of even wall thickness. By this process, pipe of same dimensions as extra heavy wrought is being made of low alloy Cr-Ni iron. Resistance to corrosion is one of the chief properties. This method is used by the Walworth Ala. Co. at Attalla, Ala. VSP (22)

Production of Metal Sockets to be Machined All Over. (Die Herstellung allseitig zu bearbeitender Metallbüchsen.) E. BECKER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 2, 1933, pages 139-142. Various methods of processing are considered including casting in permanent molds. The structure of sockets made in permanent molds are in general superior to sand cast ones. GN (22)

Modern Core Removing Machine. (Neue Kernlösemaschine.) R. BERGER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Mar. 5, 1933, pages 93-94. After briefly considering disadvantages of method used to remove pressed cores from core box, a special core removing machine, built by the O. Ullrich Co., Leipzig, is illustrated and described. Construction and operation are fully dealt with. Considerable saving of time and core box material are possible. GN (22)

"Typing" Process of Making Forging Dies Lowers Ford Costs. *Iron Age,* Vol. 129, Mar. 17, 1932, pages 660-661. Die typing is a process by which a hardened master die is driven into a heated block of steel. Many parts are forged or trimmed by these new type dies. Small dies are typed in punch press with a capacity ranging from 400 to 500 tons. On larger dies a 2500-lb. steam hammer is used. Atmosphere control in furnace is important factor in typing dies. From one master die 500 to 1000 types can be produced and from each of which 200 to 800 dies are made. VSP (22)

The Importance of Details. *Foundry Trade Journal,* Vol. 47, Oct. 20, 1932, page 233. A simple device is described for facilitating machine molding. Diagrams illustrate use of 4 loose strips placed, together with pattern, on plate. After filling and squeezing in usual way, box is turned, strips removed, and parting sand put on. OWE (22)

Erith Sand. *Foundry Trade Journal,* Vol. 47, Nov. 24, 1932, page 313. Includes results of mechanical analysis of Erith loam. Tables are given, showing (1) the size of the sand grains, (2) the compression strength, and (3) the permeability of the sand. OWE (22)

Expedite Construction of Pulleys. *Foundry,* Vol. 60, Dec. 1932, pages 26-27, 49-50. Practically all foundries manufacturing cast Fe pulleys are equipped with machines for the purpose and which eliminate most of the hazards. Describes methods and equipment used by the Hill Clutch Machine and Foundry Co., Cleveland, in production of 2 lines of castings. VSP (22)

Accuracy Features Cylinder Cores. *Foundry,* Vol. 60, Nov. 1932, pages 12-14, 56. Successful casting of Ford V-8 engine cylinders based on precision of positions in assembly. New procedure in pattern making, checking of core assemblies and degree of accuracy prevailing in entire preparation of molds was evolved. Fe used for casting consists of 1.80 to 2.10% Si; 0.60 to 0.80% Mn; 3.20 to 3.50% C; S 0.10 maximum and P 0.25 to 0.32%. Cupola charge contains 15% steel scrap. VSP (22)

Flask Guides. (Einiges aus der Praxis der Formkastenführungen.) HUGO HOLLWEG. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Feb. 19, 1933, pages 68-70. Gives practical hints as regards pins and guides of flasks to obtain castings free from fins. GN (22)

Cheap, Yet Clean and Durable Molding Plates. (Billige und doch saubere und dauerhafte Modellplatten.) HUGO HOLLWEG. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Apr. 2, 1933, pages 143-144. After discussing various types of molding plates used, author describes a special plate made of hard Pb (42% Pb, 42% Sn and 16% Sb). GN (22)

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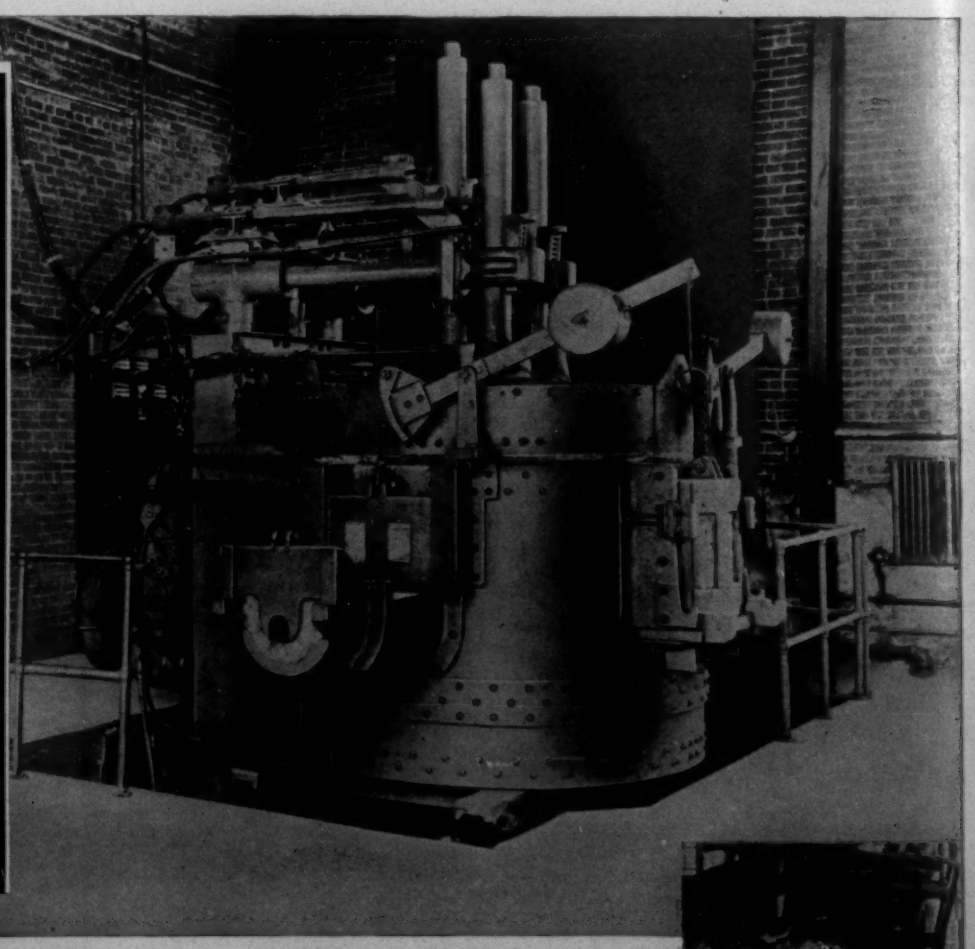

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FURNACES & FUELS (23)

International Handbook of the By-Product Coke Industry. W. Gluud. American Edition by D. L. Jacobson. Chemical Catalog Co., New York, 1932. Cloth, 6½x9¼ inches, 879 pages. Price $15.00. This work originally was published in German in 2 parts during 1927-28. It has now been translated into English and revised so that it is international in scope and has been printed as English and American Editions which are stated to be practically identical. The American Edition has been sponsored by the Koppers Company with D. L. Jacobson as co-author. 1

The work includes a scientific section (154 pages) covering the origin, composition, classification, analysis and the properties of coal from the standpoint of coking and a technical section (680 pages) which is a treatise on the art and science of byproduct coking.

The subject matter is predicated on complete references of international distribution but predominately German and supplies a fund of information which, in the past, has not been easily available to many. The book is well illustrated.
F. B. Hobart (23)-B- 2

Electric Furnaces for Heat-treatment. (Die elektrische Warmbehandlung.) E. F. Russ. R. Oldenbourg Verlag, Berlin, 1933. Cloth, 6½x9½ inches, 259 pages. Price 14 RM. Deals chiefly with equipment rather than with principles. There is practically no, or only very sketchy, metallurgical discussion of the heat-treating processes carried out in electric furnaces. Much attention is paid to constructional details. While some other types and makes are described and illustrated, emphasis is laid on the furnaces built by the author's own firm.

Pyrometers and temperature regulators are described, largely by illustrations, without much description of how to obtain temperature uniformity in the charge.

Continuous furnaces are described at length, giving a picture of German practice in design of such furnaces. Enameling furnaces, nitriding furnaces, drying ovens for cores, baking enamels, etc., furnaces for burning porcelain, glass lehrs, roll heaters and the like are briefly considered. 3

There is sketchy treatment of refractories, even more sketchy discussion of resistor elements, and nothing at all on heat-resistant alloys.

The book will appeal to makers of electric resistor furnaces and has some features of interest to their users, but contains very little direct metallurgical information.
H. W. Gillett (23)-B-

A New Melting Furnace. (Ein neuer Schmelzofen.) Julius Schneider. *Deutsche Goldschmiedezeitung,* Vol. 36, May 6, 1933, page 196. Description of a new electric universal crucible melting furnace for melting quantities up to 500 g. built according to the Helberger patents. GN (23) 4

Electric Melting Furnaces for Bearing Metal. (Elektrisch beheizte Lagermetall-Schmelzöfen.) *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, May 14, 1933, pages 205-206. Description of such furnaces and discussion of their advantages. GN (23)

Electric Heat for Babbitting Bearings. Wirt S. Scott. *Heat Treating & Forging,* Vol. 19, Jan. 1933, pages 17-18, 20. By replacing coke with electricity in its babbitting department, the Norfolk & Western Railway Co. has obtained uniform bearings at greatly reduced costs. MS (23)

Redesigns Electric Melting Furnace. Ralph R. West. *Foundry,* Vol. 60, Dec. 1932, pages 18-19, 52. Changes reduce electrical charge and permit pouring metals 5 days a week. Due to necessity of cost reduction old furnace 3000 lbs./hr. capacity was changed to smaller type of 1000 lbs./hr. Total cost of furnace changes amounted to $426.50. Physical and chemical properties of heats made in redesigned furnace are given. VSP (23) 5

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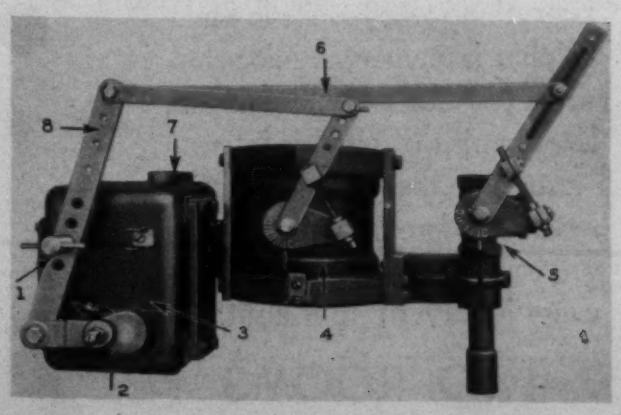

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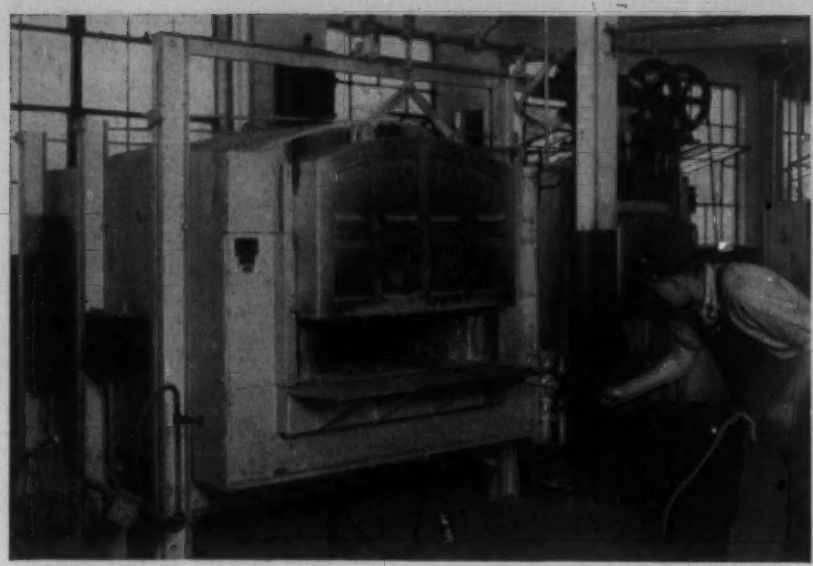

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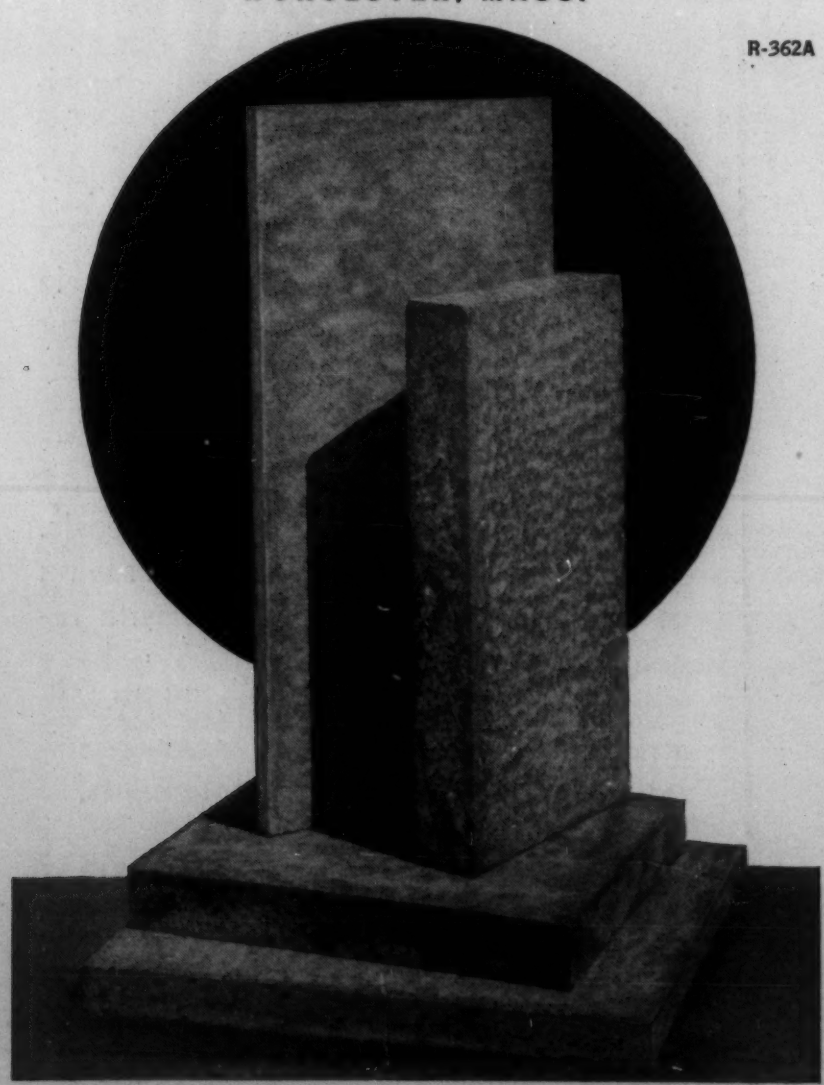

REFRACTORIES & FURNACE MATERIALS (24)

Monolithic Linings for Induction Furnaces Melting Non-ferrous Metals. P. S. KINGSLEY. *Metals & Alloys*, Vol. 4, May 1933, pages 59-62. The technique of mixing and placing solid linings in induction furnaces is given. The material chosen should be well raked with the amount of water recommended by the maker, adding a small amount at a time. Amount of ramming by the air hammer should be adjusted to prevent flow of cement in place. A layer 3 in. thick placed at one time can be rammed without layer cracks if the top of each layer is well broken up with a pick before applying the next layer. Magnesia cement lining should be carried to within an inch of the top to allow for permanent expansion on heating. Chrome cements should be carried up flush with the top as they do not have this growth. At least 48 hrs. should be allowed for removal of excess moisture and chemical changes in the cement. The wooden core forming the secondary channel is burned out using a torch, or resistance strip placed in the core before ramming which burns the core when current is induced by the primary coil. The furnace is heated to 200°F. for 48 hrs., then to 400°F. for 48 hrs. The author uses the resistance strip for the 1st period and a resistance coil in the crucible for the 2nd period. Movement and jarring should be avoided at this stage. A torch for heating the lining is described. The importance of thoroughly preparing and heating the secondary channel is stressed. WLC (24)

Refractory Material for Extreme Temperatures. (Hochfeuerfeste Sondermaterialien für hohe Temperaturen.) GALLUS. *Die Wärme*, Vol. 55, Sept. 17, 1932, pages 644-646. The reasons for the development of "special refractory materials" surpassing the m.p. of kaolin (1770°C.) are given and the following highly fireproof materials are fully discussed: (1) Al_2O_3 (Corund) m.p. 1825-1920°C., softening p. = 1700°C. under 2 kg./cm.^{2} load, great compressive strength at elevated temperatures; (2) SiC (Carborundum) m.p. = 2000°C., remarkable thermal conductivity, great resistance to temperature changes, low resistance to slags rich in Fe, less suited for oil firing, softening point = 1780°C. under 2 kg./cm.^{2} load. Material with 60% SiC has a m.p. of 1880°C. Due to the high costs, ordinary clay with surface layers of the above materials are often employed, the proper forms of which are considered. (3) Magnesite, m.p. = 2000°C., softening p. = 1500°C. at 2 kg./cm.^{2}, very sensitive to temperature changes. (4) Zr-silicate, m.p. = 1850°C., s.p. = 1460°C., remarkable chemical resistance, therefore very suitable for certain metallurgical purposes. The same holds true for (5) Cr ore bricks with a m.p. = 1920°C. and s.p. = 1460°C. More recently introduced is (6) Sillimanite, $Al_2O_3.SiO_2$, m.p. = 1850°C., s.p. = 1600°C., very resistant to chemical influences and temperature changes. Liable to volatization above 3000°C. is (7) C used for bricks with tar as binding agent, s.p. = 1800°C. Subject to burning. Used for hearth material of Fe blast furnaces and smelting furnaces. Some metal oxides and oxides of rare earths are too expensive and are principally used for laboratory apparatus, crucibles and small electric furnaces. (8) MgO, m.p. = 2800°C. is rather porous. (9) Al_2O_3, m.p. = 2100°C. Both oxides are characterized by large compressive strength, electric resistance and corrosion stability. (10) ZrO_2, m.p. = 2950-3000°C. can be quenched in incandescent state without cracking, chemically highly resistant, even to melting alkalies, while some difficulties in shaping are encountered. (11) ThO_2, m.p. = 2500°C. A recent contribution is represented by (12) boron nitride which melts above 3000°C. but is only stable in reducing atmospheres. Well suited for electric resistance furnace with C filling. EF (24)

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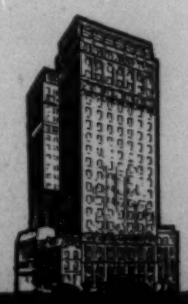

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Insulation Materials and Their Testing. (Isolierstoffe und Ihre Prüfung.) F. Kofler & M. Brandt. *Die Wärme,* Vol. 56, Apr. 16, 1933, pages 230-233. The interest of the metallurgist is attracted by a special chapter devoted to insulation of metallurgical furnaces. EF (24)

Refractories. J. C. Green. *Foundry Trade Journal,* Vol. 48, Mar. 23, 1933, pages 208-209. Summarizes modern practice under headings of grog content, firing, linings, placing of material, and patching of linings. OWE (24)

Refractories for Highest Requirements. (Hochfeuerfeste Baustoffe für stärkste Beanspruchungen.) *Technische Blätter der deutschen Bergwerkszeitung,* Vol. 23, Aug. 13, 1933, page 438. Refers to newly developed refractories with a high amount of sillimanite. Data on properties of such bricks with as much as 90% sillimanite show that they surpass by far common fire clay and silica bricks. Sillimanite bricks are particularly distinguished by high resistivity to thermal changes, steady heat expansion and high stability to softening under pressure at high temperatures. Application to various metallurgical purposes is briefly outlined. GN (24)

Better Refractories Aid Blast-furnace Practice. Ralph H. Sweetser. *Blast Furnace & Steel Plant,* Vol. 20, Oct. 1932, pages 794-796. From *Mining & Metallurgy.* See *Metals & Alloys,* Vol. 4, Sept. 1933, page MA 301. MS (24)

Silica as a Refractory Material. C. N. Witherow. *Brick & Clay Record,* Vol. 82, Apr. 1933, pages 123-124, 137; May 1933, pages 164-165, 171; June 1933, pages 208-209. Fundamental physical and chemical properties of silica as a refractory are discussed. The silica inversions and the effects upon its usefulness as a furnace material are explained. The alumina-silica refractories, fireclay, sillimanite, and mullite are also considered. CBJ (24)

Zirconia and Its Industrial Applications. W. O. R. Wynn. *Industrial Chemist,* Vol. 9, July 1933, pages 237-239. 30 references. This article is a brief review of the literature on the sources, preparation, properties and uses of zirconia. RAW (24)

Some Uses of Refractory Materials in the Foundry. J. G. A. Skerl. *Refractory Journal,* Vol. 9, Jan. 1933, pages 19-22; Feb. 1933, pages 59-63. See *Metals & Alloys,* Vol. 4, Sept. 1933, page MA 310. GTM (24)

Sidelights on Refractories in Open-Hearth Practice. R. Percival Smith. *Gas Journal,* Vol. 200, Oct. 12, 1932, page 156. Extract of paper presented before 26th meeting, Refractory Materials Section, Ceramic Society, London, Sept. 20-21, 1932. Article has special reference to open-hearth furnace refractories. Stress is laid on the necessity of using well-dried bricks and of ascertaining the proportionate cost of refractories for each part of the furnace, in order to see where it may be possible to effect economies. Particulars are given concerning tests made with ladles, checkers, air ends, ports, gas and air slopes, open-hearth walls, sloping back walls, open-hearth crown, maintenance of roof costs, and mold shop refractories many of which pointed the way to important improvements. See also *Metals & Alloys,* Vol. 4, Sept. 1933, page MA 301. MAB (24)

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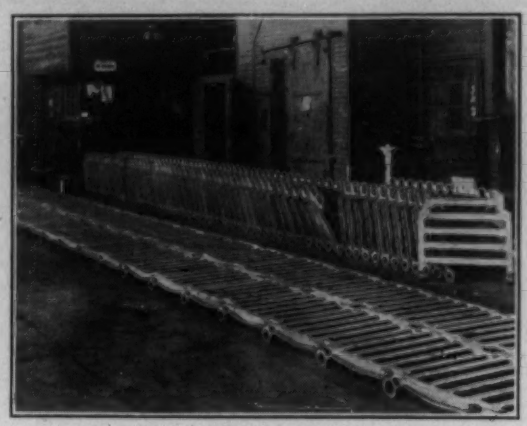

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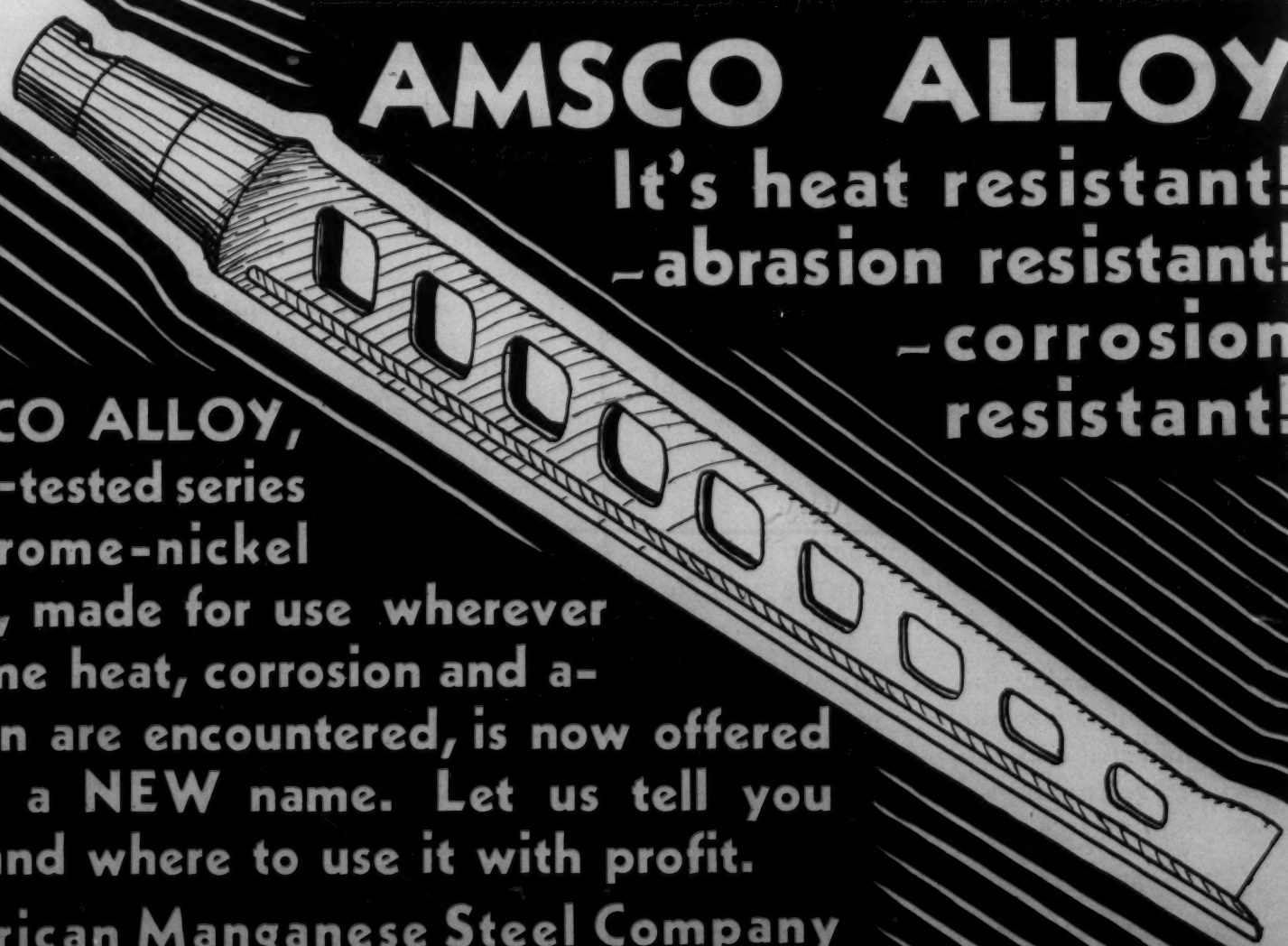
EFFECT OF TEMPERATURE ON METALS & ALLOYS (29)

With ever increasing temperatures and pressures==what?

These abstracts are prepared in cooperation with the Joint High Temperature Committee of the A. S. M. E. and the A. S. T. M.

Process of the Creep of Metals and Its Progress. ATSUMARO SHIMIDZU. *Journal Society of Mechanical Engineers*, Tokyo, Vol. 36, Jan. 1933, pages 7-11. Paper read before 217th meeting of Society, June 29, 1932. By means of the combination of a mechano-optical device with a rotating drum, more minute time-elongation curves were obtained yielding a magnification of the deformation by 100 or 180 times; with these data, the external process of creep and its progress could be investigated more accurately. At the same time, the whole time-duration of creep was divided into many stages, at each of which a microphotograph was taken in order to make clear the internal mechanism of creep in relation to the crystal arrangement. The materials employed were a low carbon steel and aluminum plate. The experiments proved that the process of creep is not only a plastic flow of metal or the repetition of sudden yieldings, dependent only on the temperature, but represents an alternate repetition of 2 kinds of deformations taking place simultaneously. Kz (29)

Hot-hardness of High-speed Steels and Related Alloys. OSCAR E. HARDER & H. A. GROVE. *American Institute of Mining & Metallurgical Engineers, Technical Publication* No. 497, Feb. 1933, 39 pages. Previous work on the hot-hardness of steels is reviewed. Hardness at temperatures up to 800° C. was determined by Cowdrey's method in which 2 similar cylindrical specimens are pressed together and the flattened areas determined. These hardness values were converted to Brinell numbers by multiplying by a factor. Hardness determinations by several other methods proved that the method was satisfactory and the values accurate. The materials tested included many high-speed steels of varying analyses, die steels, Stellite, and other cutting steels. V increased the hardness of high-speed steels at high temperatures (600 to 700° C.), and so did Co. The Mo high-speed steel was softer at high temperatures than the W steels. The Stellite was softer at temperatures below 600° C., but harder than high-speed steels at higher temperatures. Hot-hardness tests were also made on high-speed tools used by French and Digges in determining tool life. There appeared to be no relationship between hardness at 600° C. and tool life, but an indicated correlation between hardness at 700° C. and Taylor speed or cutting life was found. 24 references. JLG (29)



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On Steel Tubes for High-Pressure and High-Temperature Water Tube Boilers. MURAJI KINUGAWA. *Journal Society of Mechanical Engineers,* Tokyo, Vol. 36, Jan. 1933, pages 12-21. Paper read before 44th meeting of Western Division of Society, Sept. 15, 1932. Classifies boiler plants as to their working pressure and total temperature of super-heated steam. Causes of various defects occurring at steel tubes are discussed. As result of investigations necessary properties for steel tubes are described and attention to their design is given. Kz (29)

Some Factors Affecting Furnace Practice. R. J. SARJANT, *Engineering,* Vol. 134, Oct. 21, 1932, page 472. Abstract of paper read before the Ceramic Society, London, Sept. 1932. Deals with recent progress made with 3 types of heat-resisting alloy steels. The 3 types include: Cr alloys with small amounts of Ni and Mo utilized for temperatures up to 600° C.; steels containing 18-25% Cr, 7-12% Ni and a little Si and W for temperatures up to 950° C.; high-Cr irons with 0.5-2% C and 25-30% Cr or high Ni-Cr steels with 15-30% Cr and 12-80% Ni for temperatures up to 1100° C. LFM (29)

Growing Cast Iron. (Wachsendes Gusseisen.) A. F. HAGER. *Zeitschrift für die gesamte Giessereipraxis,* Vol. 54, Mar. 19, 1933, pages 112-113. Discussion of detrimental effects of growth and effect of various elements on tendency to growth. GN (29)

Creep Tests Require Long and Precise Observations. Correspondence from WALTER ROSENHAIN. *Metal Progress,* Vol. 22, Dec. 1932, pages 50, 53-54, 56. Short period creep tests are unreliable and do not show whether creep ceases in course of time or continues or increases. In some tests a graph showed the creep diminished for a time but at a later stage increased rapidly with ensuing rupture. Such ruptures show intercrystalline fracture which is not due to a defect or impurity in the metal. They are due to the fact that the cohesion between the crystals diminishes with rising temperature faster than the strength of the crystals themselves. Other factors in creep tests are recrystallization and grain growth, softening by "crystal recovery" and the chemical effect of the atmosphere on the surface and internal cohesion of the metal. WLC (29)

Creep Strength of Steels for Superheater Tubes. (Dauerstandfestigkeit von Stählen für Ueberhitzerrohre.) A. POMP & W. ENDERS. *Mitteilungen aus dem Kaiser-Wilhelm-Institut für Eisenforschung,* Vol. 14, No. 18, 1932, pages 26-269. A testing plant especially developed for measuring the creep strength of steels used in high-temperature steam plants is described. 2 plain and 5 low-alloyed steels (Ni, Mo, Mo-Cu, Cr-Mo and Cu) were tested by an abbreviated process at 350°, 400°, 450°, 500°, 550° and 600° C. Steel alloyed with Cr and Mo proved decidedly superior to the others up to 550° C. At 600° C., however, Mo steel and Cu steel showed the highest values, especially the latter shows a high creep strength. Tables give the physical properties of all steels at the temperatures named. Ha (29)

Influence of Grain Size on the Properties and Corrosion Resistance of the 18-8 Iron-Chromium-Nickel Alloy for Elevated Temperature Service. H. D. NEWELL. *Transactions American Society for Steel Treating,* Vol. 19, June 1932, pages 673-751. Previously abstracted as Preprint No. 17, 1931. Includes discussion. See *Metals & Alloys,* Vol. 2, Dec. 1931, page 325. WLC (29)

Satisfactory and Early Experiences with High Alloys. Correspondence from G. C. MCCORMICK. *Metal Progress,* Vol. 22, Dec. 1932, page 48. Refers to article Design of Heat Resisting Castings in Oct. *Metal Progress.* Heat resisting alloys were used before 1928 in furnaces but not in mechanisms such as walking beam conveyors. The 35 Ni 15 Cr alloy had been widely used in furnaces before and since 1928. The comments on design were highly pertinent because of harm done by improper use of structural formulas in this field. WLC (29)

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REDUCTION METALLURGY (13)

On the Road Towards Production of Sponge Iron on Plant Scale. BEZMELNITZYN. *Domez,* No. 2-3, 1933, pages 24-33. Briquetting ore with anthracite is not satisfactory for production of sponge iron. Briquettes disintegrate at 800° C. Loose mixture of 70% ore with 30% powdered anthracite heated on trays in layers 80 mm. deep produced sponge with 0.7% C. Trays were introduced into furnace at 500° C., brought to 1150° C. in 14 hours, soaked at this temperature for 4 hours and cooled to 800° C. in 3 hours. From 5 tons of ore and 2 tons of anthracite, 3.5 tons of sponge were produced with a heavy-oil consumption of 44.7% of the weight of the sponge. Three heats were made in a 5 ton open hearth furnace with sponge replacing part of scrap. The metal produced was satisfactory. (31)

Production of Iron Sponge by Norsk-Staal Process. (Die Erzeugung von Eisenschwamm nach dem Norsk-Staal-Verfahren.) KUNZE. *Elektrowärme,* Vol. 2, Sept. 1932, pages 197-200. Progress made in method to produce steel directly from ore without first producing pig-Fe in the blast furnace is reviewed. Edwin process and first German installation in Bochum are described in detail. Process is economical only if Fe sponge contains 94 to 95% Fe with very little S and P. This could be realized by briquetted ores from Sydvaranger (Sweden). Reduction of ore to sponge is carried out by gas of 40% H and 60% CO which is heated in an electric arc furnace to high temperature. Gas is circulated and part of H used in reduction is replaced by addition of 50% coke oven gas and 25% CH_4. After passing through a layer of lime, gas enters the reduction furnace at 1000° C. from which it leaves enriched with CO_2 from the ore. From here gas again goes to cleaner. Reverberatory furnace consists of 3 single furnaces, first roasting furnace which heats cold Fe ore to 1000° C., reduction furnace where ore comes in contact with reducing gas, and cooling furnace where sponge is cooled by recuperating heat to 50° C. with exclusion of air. Finished sponge is pressed into smaller pieces which are converted in electric furnaces into steel. Ha (31)

The Production of Low-Sulphur Sponge Iron from Ore-Coal Mixtures. T. W. HARDY, H. H. BLEAKNEY & W. S. JENKINS. *Canada Department of Mines, Mines Branch, Report* No. 728, 1932, pages 150-156. Production of low-S sponge Fe from ores and coals of commercial grade was investigated. Charging CaO with the ore-coal mixture fixed the S as CaS; a low-S Fe can be recovered magnetically. Sponge Fe prepared without lime gave S 0.54-0.71% after wet magnetic concentration; using lime the S content was 0.03-0.09%. AHE (31)

Commercial Sponge Iron. *Iron & Steel of Canada,* Vol. 15, Sept. 1932, pages 105-106. Description of Wiberg process at present being operated in Sweden. Chemistry of process and arrangement of furnace illustrated. OWE (31)

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MANUFACTURERS' LITERATURE

Recording Thermometer and Pressure Gauge

The Brown Instrument Company has just announced their new thermometer and pressure gauge that incorporates nineteen improvements and advantages. It will withstand 100% overloads, and has a spring-bellows mechanism for pressures between 30 and 200 lbs. that gives a powerful pen action in this range. Their catalog No. 6702 gives a full description of all nineteen features. (304)

Dascoloy

An attractive leaflet from the Detroit Alloy Steel Company is devoted to their "Dascoloy," a chromium cobalt alloy tool steel. This steel is indicated for use on blanking, forming, drawing, coining and embossing dies; for shear blades, punches and dies on hot press work; for gauges such as thread, plug, ring and snap gauges, etc. One section of the leaflet gives full directions for shop practice for users of Dascoloy. (305)

Chromium Steel Alloy

Bulletin S-33 of the Allegheny Steel Company is devoted to their Allegheny-33, a corrosion resisting chromium-steel alloy. Its chemical composition and physical properties are given as well as a list showing its resistance to the more generally used chemical reagents and to various types of atmosphere. (306)

Rust Preventive

A leaflet from the Dearborn Chemical Company recommends the use of their No-Ox-Id for the prevention of rust in refrigerating plants inasmuch as it does not retard refrigeration. It may be used on underground piping, condenser stands, drip troughs, inside of air compressor tanks, etc. (307)

Hot Tops for Ingot Molds

The Ferro Engineering Company has prepared a 21-page pamphlet devoted to hot tops for ingot molds. The advantages in the use of their C&D hot top are enumerated. This top is essentially a cast iron jacket lined with refractory brick. A particular feature is a wiper strip of thin sheet metal which engages the inner wall of the mold and prevents leakage of hot metal into the space between the mold wall and the casting. (308)

Metal Melting Furnaces

Catalog No. 28 from the Campbell-Hausfeld Company illustrates various types of their crucible furnaces, aluminum melting furnaces as well as such foundry accessories as furnace linings, skimmers, nozzles and ingot molds. (309)

Simplified Arc Welding

The use of electric arc welding in solving factory production problems, in oil field and highway maintenance is discussed in a booklet sent out by Hobart Brothers Company. Their portable and stationary welders are described and illustrated with emphasis on the "simplified" features such as remote control, meter readings, stabilization, portable mounting, etc. (310)

Electric Furnaces

A most attractive pamphlet prepared by the Detroit Electric Furnace Company is available to designers and buyers of castings and to foundrymen. The advantages of the application of their furnaces in the production of ferrous and non-ferrous metals and alloys of many varieties are discussed in detail, several pages being devoted to operating cost data. (311)

Steel for High Temperatures

Pyrasteel, a Cr-Ni-Si alloy developed by the Chicago Steel Foundry Company, is recommended for use in carbonizing boxes, for furnace conveyors and for oil burners in a booklet sent out by the company. A valuable characteristic of this alloy is that it is free from scaling and so may be cast in as thin and light sections as cast iron. (312)

Razor Blade Furnace

Bulletin No. 341 from the W. S. Rockwell Company describes their furnace for the continuous hardening, coloring and tempering of razor blade strip. These furnaces can be furnished in various sizes and may be either electric or gas fired. (313)

Carburizing Compound

A leaflet issued by Wheelock, Lovejoy & Company describes Whelcite, a carburizing compound which is inspected for uniformity. It is furnished in two grades, one for general carburizing work and the other for small articles such as ball bearings, spinning rings, etc. Directions for its use are included. (314)

Continuous Gas Carburizing Furnaces

The many advantages of the "Eutectrol" process of continuous gas carburizing are listed in the latest bulletin from the Surface Combustion Corporation. Savings of 35 to 60% have been reported by users of these furnaces. Performance data on one installation are given and several illustrations show its construction. (315)

High Temperature Mortars

A recent booklet from the General Refractories Company describes their various kinds of high temperature mortar mentioning briefly the outstanding advantages of each. (316)

Silicon Bronzes

The Bridgeport Brass Company has announced an addition to their line of Duronze silicon bronze alloys. Duronze II was developed to meet the requirements for a strong hot forging alloy having fair cold working properties. Duronze III combines great hardness with unusual high strength as well as fine corrosion resistance and low coefficient of friction. A booklet from the company discusses these alloys. (317)

Heat and Acid Resisting Castings

The most popular analyses of Standard-Alloys are listed in Bulletin No. 21, together with safe workable loads at different temperatures. (318)

Electric Furnaces

Bulletin 833 from the Cooley Electric Furnace Company is devoted to their Bluehead muffle furnace, type MP. Specifications for the various sizes are given. The company also supplies tilting crucible furnaces and standard types and sizes of tool room furnaces. (319)

Brass Ingots

An attractive booklet from the Ajax Metal Company describes their Seven Point and Golden Glow ingots. Several useful tables are included, one giving the A.S.T.M. Tentative Specifications for standard alloys and another giving an arbitrary classification of alloys for those users who do not conform to the A.S.T.M. Specifications. (320)

Metal Spraying

The Metals Coating Company of America has issued a leaflet which discusses their Metalayer, a process and equipment for simultaneously melting, atomizing and applying on any surface, coatings of any of the commercial metals. Unique and attractive decorative effects may be obtained by the use of this process and the coating protects the material against corrosion or chemical action. (321)

Refractories

A "super-refractory," Sillimanite, is discussed in a booklet received from Chas. Taylor Sons Company. Its chemical composition and properties are given in complete detail and several pages are devoted to uses for which it is suitable. (322)

Aluminum Bronze Die Castings

The Aurora Metal Company has prepared a folder on the composition and characteristics of their aluminum bronze die castings. These castings are so uniform in size and shape that little time is required for machining and finishing thus eliminating production cost problems. (323)

Carbon Steels

A 62-page book issued by the Carnegie Steel Company presents the results of an extensive study of methods for the control of factors in the manufacture of steel by the basic open hearth process. The importance of this study to the consumer is emphasized and the system of control evolved is discussed. (324)

Pressure Instruments

Recording, controlling and indicating pressure instruments are described in a new 40-page bulletin from the Foxboro Company. Illustrations and complete descriptions of the various instruments aid in the selection of the proper one for any process. (325)

Rubber as Engineering Material

Some interesting work on the industrial applications of rubber in resisting corrosion or avoiding contamination provides the subject matter for a paper prepared by H. E. Fritz and J. R. Hoover. A table shows some of the industrial chemicals which are successfully handled in rubber-lined equipment. Reprints of the paper are being distributed by the B. F. Goodrich Company. (326)

Aluminum for Truck Bodies

The Aluminum Company of America has issued a new edition of their earlier booklet on Alcoa aluminum for truck bodies. It contains detailed engineering data and suggested designs for various types of truck bodies, supplemented with construction drawings printed on paper suitable for blueprinting. (327)

Nickel—Copper—Chromium Cast Iron

No. 208 in the series of technical articles on nickel cast iron prepared by the International Nickel Company gives the results of tests conducted upon Ni-Resist, a corrosion and heat resistant nickel-copper-chromium cast iron. These tests show that this material may be readily cast, machined and welded and in addition to being considerably more corrosion and heat resistant than plain iron offers many attractive features at a reasonably low cost. (328)

Hydraulic Cement

A Manual for the Use of Lumnite in Oil Refineries has been compiled by Atlas Lumnite Cement Company. It may be used for protective coatings or linings in soaking drums, as a binder in making refractory concrete linings, shapes and mixtures, for cement floor surfaces, etc. Complete directions for its use in each case are given. (329)

Surface Grinding Machines

Several types and sizes of hydraulic surface grinding machines are illustrated in a recent pamphlet from the Thompson Grinder Company. All operating functions of these machines are conveniently controlled from a central valve panel. Specifications for the various sizes are given. (330)

Insulation

The Armstrong Cork & Insulation Company is distributing reprints of an article entitled "Insulating Open-Hearth Furnaces." For temperatures to 2500° F. the use of Armstrong's insulating brick is suggested, for temperatures to 1600° F. Nonpareil insulating brick is safe. These brick are available in a variety of shapes and sizes. (331)

METALS & ALLOYS, 330 West 42nd St., New York, N. Y.

I should like a copy of each piece of Manufacturers' Literature listed below.

.....

Name.....

Position..... **Firm**.....

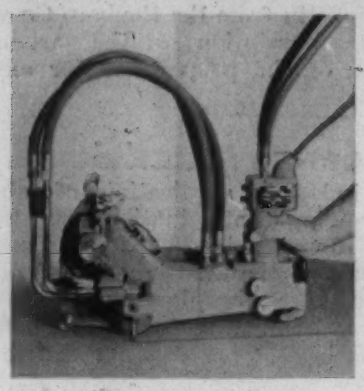
Street and Number.....

City..... **State**.....

NEW MATERIALS and EQUIPMENT

New Portable Cutting Machine

A portable cutting machine weighing but 43 lb. has been announced by The Linde Air Products Company, New York. It is known as the Secator. Combining the portability of a blowpipe with the accuracy and finish of a cutting machine, the Secator makes it possible to do high-quality cutting anywhere in the shop or in the field.



Essentially it consists of an Oxweld Type C-14-H blowpipe (especially designed for it) mounted on an electrically driven, air-cooled, dust-proof chassis. It is equipped with a direct drive and runs either on a 1½ in. angle-iron track, furnished with it, or on any relatively smooth plate. When operated on the track, it does straight-line cutting automatically. For cutting simple shapes it can be guided with a hand-grip. For automatic circle-cutting, a center and a radius rod are furnished. For convenience of control, the oxygen and acetylene valves are on the chassis rather than on the blowpipe. The blowpipe can be adjusted vertically and horizontally and also to cut bevels up to 45°. Its cutting range is that of the C-14 blowpipe and the cuts are so clean and smooth that for many purposes machining is unnecessary.

Metals & Alloys, December 1933

New Hydraulic Monolithic Refractory

Hydrecon, a new refractory product manufactured by the J. H. France Refractories Company, Snowshoe, Pa., permits forming a refractory lining in a furnace by pouring the material into place. Hydrecon is supplied ready to use with the addition of about 19% of water. The grog is a high grade, crystalline, natural refractory somewhat similar to flint clay. The bonding material is made of the same high grade natural refractory treated with the requisite chemical substances to give hydraulic properties. The refractory has a cold strength of about 1300 lbs./in.^{2} To develop maximum strength and to obtain the best results the forms should be removed from the completed concrete mass within 10 to 12 hrs. to allow it to set under normal temperature conditions, but it must be kept damp by covering with wet burlap for a period of 2 to 5 days. The fusion point of Hydrecon No. 69 is 3290° F. and the safe working wall temperature is 3000° F. Shrinkage tests of Hydrecon gave a range from nil at 600°F. to less than 2% at 2732°F. The chemical composition of Hydrecon differs from that of the usual monolithic refractory in having a considerably higher content of alumina. Three grades of Hydrecon are available: No. 115 Hydrecon—This is used for hearth cement, baffles, door linings and other such places where high cold strength is required and low temperatures (up to 2400°F.) are used; No. 5 Hydrecon—This can be used in any place where first quality firebrick is required, up to average working temperatures, 2700° F.; No. 69 Hydrecon—This is a super-refractory which will withstand wall temperatures up to 3000° F. Hydrecon has been used for burner ports, door linings, baffles, etc. in a wide variety of furnaces in the iron and steel industry; in the iron foundry for semi-permanent molds in repetition casting, etc.

Metals & Alloys, December 1933

New Micarta for Roll Neck Bearings

A new grade of Micarta, known as grade No. 1C17, has been developed by the Westinghouse Elec. & Mfg. Co. for the radial part of roll neck bearing on severe applications. Grade 863, which is similar in texture, is being used for thrust plates on all bearings. It can be machined or sawed to any desired shape. The advantages of this grade for radial liners, are: Ability to stand higher thrust loads and pressures without dislamination, splitting, or working out of the chuck. Micarta No. 1C17 and 863 are green in color to distinguish them from 1B21 and 262 which have proved so successful on bar, rod, wire, and other small mills, and which may still be used for the radial parts of bearings on lighter pressure applications.

Metals & Alloys, December 1933

Automatic Pre-Set Screwdown Control

For use in connection with automatically controlling the movement of screwdown motors in accordance with a predetermined schedule; The Electric Controller & Mfg. Co., announce the EC&M Automatic Pre-Set Screwdown Control. A schedule giving the proper draft for each pass for a specified ingot or bloom is worked out by the blooming mill superintendent or the metallurgist. The control is set up for this schedule on a simple plug panel. The screwdown operator simply pushes a button for each pass and the rolls are swiftly moved to the exact setting specified. This control has been worked out to meet the requirements of almost any type of mill. The set-up is not limited to one rolling schedule; as many rolling schedules as desired can be provided for and set up at the same time. To change from one schedule to another is merely a matter of pushing a button. In case of a cobble or any other emergency condition, the operator has instantly available full hand control in the usual manner. Automatic Pre-set Screwdown Control also offers important advantages for finishing mills. Accurate control of the gage on finishing passes is insured with this system. This is of particular importance where steel is sold by length rather than by weight and must be within specified tolerance. Many mills can be speeded up by the installation of Automatic

Pre-set Screwdown Control by eliminating lost time in setting the rolls for each pass. Installation of the EC&M Automatic Pre-set Screwdown Control to an existing mill is quite simple. A small synchronous-tie motor is mounted on the mill and geared to the screwdown drive. A compact control bench mounting the push buttons, master controller and indicator lights is mounted in the control pulpit. The contactor panel and schedule set-up panels and compact cut-out limit switch mechanism is all mounted in the control room. Advantages claimed for this new development are:

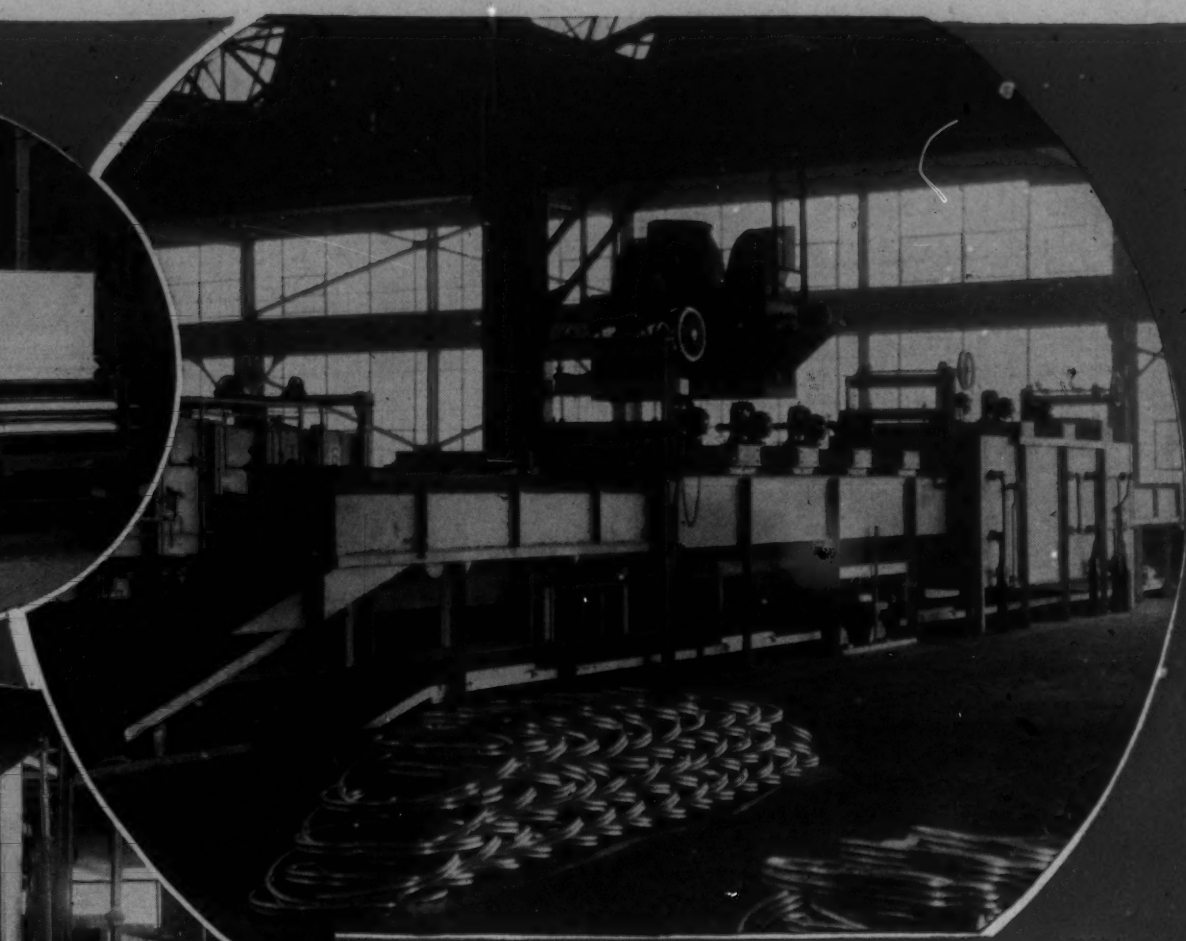
1. Proper and accurate drafts are always secured irrespective of change of operators or of degree of skill of operators.
2. A definite schedule of passes and drafts properly suited for the steel can be rigidly adhered to, insuring a uniform product.
3. Error of human judgment is removed.
4. Larger drafts than specified resulting in imperfections in the steel can be avoided.
5. When used on finishing mills, greater accuracy means fewer rejects.
6. Saves time by eliminating false movements due to "overtravel" and subsequent "inching." Rolls go to correct position and stop accurately.
7. Makes possible the ability to roll different size of ingots, etc., to different size of blooms and slabs without loss of time and yet with assurance of uniform quality of product.
8. Increases efficiency of operators—removes mental and physical strain—they merely push a button to follow a specified schedule of rolling.
9. The training period when breaking in new operators will be very materially reduced.

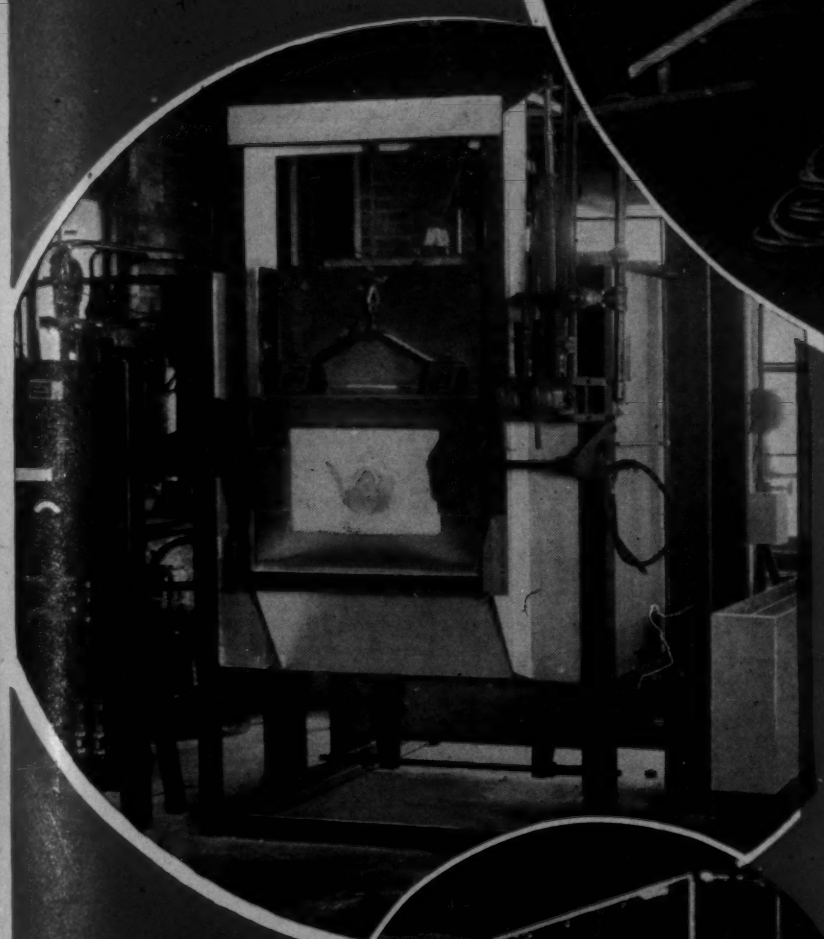
Metals & Alloys, December 1933

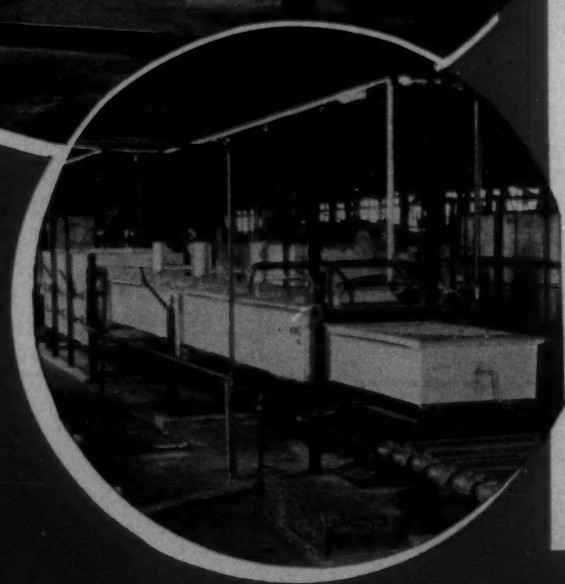
New Wire for Radio Tubes

Kemet Laboratories Company, Inc., New York, a unit of Union Carbide and Carbon Corporation, has developed and is manufacturing and selling a new wire for use in radio tubes, which consists of an alloy of molybdenum, iron and nickel (approximately 20% Mo, 20% Fe and the balance largely nickel). It has a tensile strength of about 140,000 lbs./in.^{2}, and elongation about 28-30%, has good winding qualities and is characterized by exceptionally high strength and stiffness at elevated temperatures. The tensile strength at 800° C. (1472° F.) is approximately 60,000 lbs./in.^{2} and the stiffness is comparable to that of pure molybdenum. The unique chemical and physical properties of the wire are claimed to make possible the manufacture from it by conventional methods of high quality grids for certain types of radio receiving tubes at lower cost than from any other material available.

Metals & Alloys, December 1933







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NEW CONTINUOUS BRAZING FURNACES. The most intricate assemblies are joined and delivered continuously.

STRIP ANNEALING FURNACES. A new fuel-fired removable hood type furnace anneals strip in coils—shows lower fuel and maintenance cost, shorter annealing time, more uniform results, greater flexibility and ease of operation.

WIRE ANNEALING FURNACES. An improved pit type furnace anneals wire in coils. Has the following advantages: increased tonnage per pit; improved fuel economy; more uniform anneal; improved surface condition; decreased annealing time and labor requirements.

BRIGHT ANNEALING COPPER WIRE. A new continuous furnace anneals fine copper wire on spools—bright and dry.

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